REPORT TO

GENERAL ELECTRIC INFORMATION SERVICES

ON

TIMESHARING SERVICES LOSSES TO IN-HOUSE COMPUTERS

JANUARY 18, 1976

INPUT
2180 Sand Hill Road
Suite 320
Menlo Park, CA 94025

TIMESHARING SERVICES LOSSES TO IN-HOUSE COMPUTERS

TABLE OF CONTENTS

Page

LIST OF EXHIBITS

Page

I INTRODUCTION

A. SCOPE OF WORK

- The purpose of the study was to analyze present and former customers for timesharing services who have implemented in-house timesharing systems.

- "Timesharing services" for this report is identical to the term "interactive remote computing services" normally used by INPUT; this term describes those remote computing services where the user interacts with a vendor's computer via a terminal connected to it by a communication's link, and where the user's program and data are on-line while the interaction takes place. This is thus distinguished from remote batch and inquiry services.

- The study was limited to those in-house timesharing functions established on:

    - the customer's main in-house processors, usually large-scale IBM mainframes
    - stand-alone in-house timesharing computers of the DEC 10 class and above.

Thus conversion to stand-alone or linked minicomputers was specifically excluded from this study. Future research will need to be accomplished in this area.

- Objectives of the study were to provide insight on:
  - The type and level of user service being provided, i.e., user technical support, system availability, reliability, and functional capability
  - How well the end results compare to the original plan to provide in-house service particularly relative to planned costs (savings) and actual costs (savings)
  - Reasons for the in-house movement and how it was accomplished with particular emphasis on the evaluation and decision process. Reasons other than cost were also examined
  - Costing approaches that were used such as incremental costing versus "full" costing, and the chargeback mechanism used.

B. USER RESEARCH

- As shown in Exhibit I-1, almost 50% more user interviews were carried out for this study than were contracted for. The reason was that the information obtained during the interviews varied in level of detail and coverage such that the original interviews would have provided less information on key points than was desirable.

  INPUT, therefore, decided to expand the number of interviews to a number to insure reliable data being available. This was done through

EXHIBIT I-1

USER RESEARCH TABULATION

Contacts Attempted		>100
Right Contacts Made		74
Less:		
Declines	15	
Those not fitting criteria	13	
Not completed	3	
		31
Organizations Interviewed		43

Type of Interview Completed:

	ON-SITE	TELEPHONE	TOTAL
Data Processing Managers	35	8	43
End User	27	4	31
Financial Officer	16	2	18
TOTAL	78	14	92

the use of telephone and on-site interviews. The difference in content between telephone and on-site interviews was minimal.

- The criteria for selection of a respondent varied somewhat by the progress in the study. Necessary criteria at all times were that the organization must be:

  - large, with significant in-house resources ("Fortune 50" bank or utility, or "Fortune 300" industrial)

  - a significant (at least $10,000 per month) user of timesharing services now, or in the past

  - at the least, considering establishement of an in-house time-sharing function.

  Other criteria that were used at various points were:

  - geographic location, in order to facilitate travel while obtaining adequate geographic dispersion

  - industry type

  - whether or not a GE user.

- As shown in Exhibit I-2, two-thirds of the organizations interviewed were manufacturers and banks. A list of the organizations interviewed is provided as Exhibit I-3. The list is provided so that GE can take into account the sources of the information presented in this report.

  It is possible to correlate specific interviews with respondents because of identifiable characteristics. INPUT requests that this is not done since it would impact the confidentiality of the responses.

EXHIBIT I-2

ORGANIZATIONS INTERVIEWED BY INDUSTRY TYPE

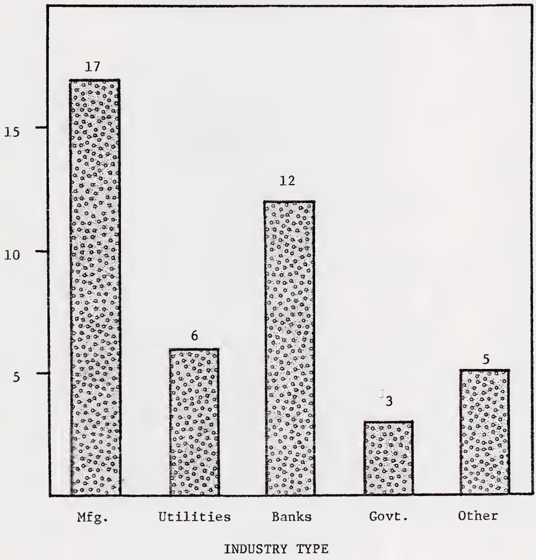


EXHIBIT I-3

ORGANIZATIONS INTERVIEWED

NAME	INDUSTRY TYPE	*TYPE OF INTERVIEW	TYPE OF QUESTIONNAIRE COMPLETED		
			DP MGR	END USER	FINANCIAL
Security Pacific	Banking	0	x	x	x
Johns Manville	Mfg.	0	x	x	
Nat'l.Oceanographic	Fed.Govt.	0	x	x	
Gates Rubber	Mfg.	0	x	x	x
Adolph Coors	Mfg.	0	x		
U.S.Dept.Agriculture	Fed.Govt.	0	x	x	
Chemical Bank	Banking	0	x		
Mobil Oil	Mfg.	0	x	x	
Consolidated Edison	Utility	0	x		
Chase Manhattan	Banking	0	x	x	
Hoffman LaRoche	Mfg.	0	x	x	
Citicorp	Banking	0	x	x	
Host International	Other	0	x		
IDS	Other	T	x	x	x
Niagra Mohawk Power	Utility	T	x		
Michigan Bell	Utility	T	x		
Cummins Engine	Mfg.	T	x		
Mellon Nat'l. Bank	Banking	T	x	x	x
First Chicago Corp.	Banking	T	x		x
Rockwell International	Mfg.	0	x		x
General Foods	Mfg.	0	x	x	
Public Service N.J.	Utility	0	x	x	
United Parcel Service	Other	0	x		
Genesco	Mfg.	T	x	x	
Potlatch	Mfg.	T	x	x	
Phillips Petroleum	Mfg.	0	x	x	x
Vought	Mfg.	0	x	x	x
Resource Sciences	Other	0	x	x	x
First Int'l.Bankshare	Banking	0	x	x	x
Cities Service	Mfg.	0	x	x	x
Amoco Product	Mfg.	0	x	x	x
Occidental Petroleum	Mfg	0	x	x	x
North Carolina National	Banking	0	x	x	x
Southern Bell	Utility	0	x	x	x
First South Services	Banking	0	x		
Duke Power	Utility	0	x	x	x
Texas Instruments	Mfg.	0	x	x	x
Kaiser/Aetna	Other	0	x		
NASA-AMES Labs	Fed.Govt.	0	x	x	
Large Bank	Banking	0	x	x	
Standard Oil of CA.	Mfg.	0	x	x	
Crocker National	Banking	0	x	x	
Wells Fargo	Banking	0	x	x	x

* 0 = on-site, T = telephone

- Of the 43 organizations interviewed, 39 had in-house timesharing functions and the remainder were considering or actually establishing such functions.

- As shown in Exhibit I-4, two-thirds of the respondents have converted outside timesharing to their in-house function. Only four companies with established in-house timesharing functions reported that they have not converted any from outside.

- The user research concentrated on GE and ex-GE customers, as shown in Exhibit I-5, in order to relate directly to GE's experience. Only 7 companies mentioning vendors did not include GE at all; in several other cases, however, GE was not the main vendor involved.

- As hypothesized prior to the study, IBM-based in-house timesharing functions predominate and are not usually based on dedicated timesharing systems. Other equipment used for in-house timesharing is usually on a dedicated basis, as shown in Exhibit I-6. Of the respondents, 14 had one or more stand-alone timesharing systems while 26 used the timesharing systems for other purposes as well.

- Interviews were carried out as follows:

  August 18 - August 30, 1976 -- initial interviews.

  September 1 - September 19, 1976 -- main research effort prior to review.

  September 20 - October 9, 1976 -- completion of on-site interviews and selected telephone interviews.

EXHIBIT I-4

RESPONDENTS' CONVERSION OF OUTSIDE TIMESHARING TO IN-HOUSE

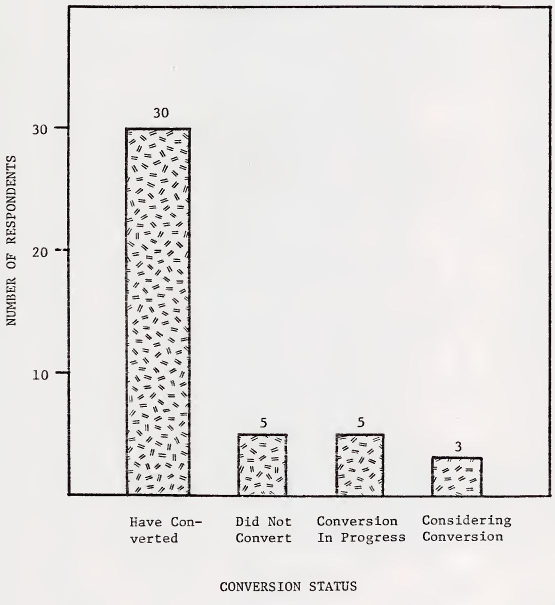


EXHIBIT I-5

VENDORS MENTIONED IN CONVERSION

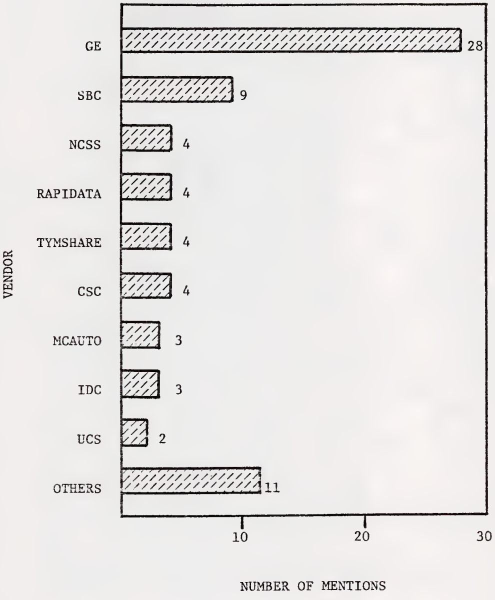
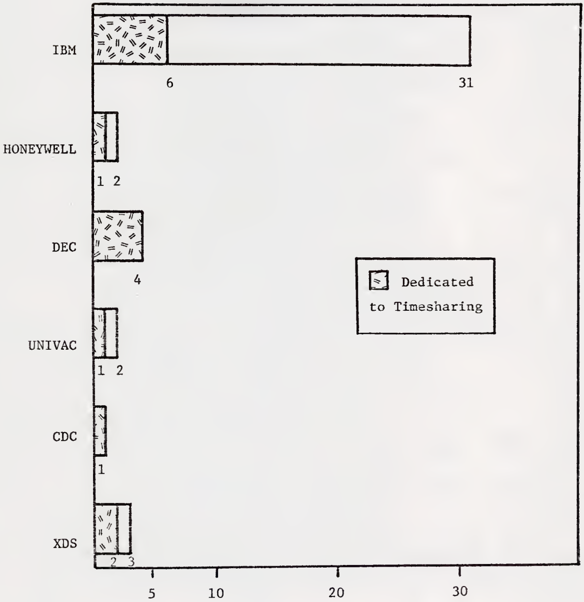


EXHIBIT I-6

COMPUTER SYSTEMS USED FOR IN-HOUSE TIMESHARING



C. VENDOR RESEARCH

- Interviews were carried out with the following remote computing services vendors:

National CSS	Rapidata	SBC	CSC
ADP-Cyphernetics	Keydata	BCS	Informatics
On-Line Systems	CDC	UCS	

- Several vendors refused to participate. One of them, Tymshare, stated that they had a very good knowledge of their losses to in-house systems through extensive and on-going research and considered this a competitive advantage; thus they would not contribute to the "pool" of knowledge.

- Interviews were also held with people knowledgeable on IBM, Honeywell and Digital Equipment Corporation approaches to timesharing.

II. EXECUTIVE SUMMARY

A. SUMMARY OF FINDINGS

1. CHARACTERISTICS OF TIMESHARING CONVERSION

- Virtually all very large organizations have now, or will shortly have, internal timesharing (T/S) functions:
    - Hardware vendors are encouraging it
    - They are necessary for program development
    - Users want this type of service integrated into their standard applications.

- Conversion of timesharing contracts to in-house is much more significant from an "opportunity cost" viewpoint than immediate revenue loss:
    - Existing applications use can be expected to double within a few years
    - Growth in existing applications plus new applications will result in a trebling of use within a few years.

- All respondents were still using outside timesharing services and intended to continue to do so:

- Demand is greater than can be handled internally
- Vendors have special capabilities
- Some end users won't change
- Conversion is not the prime objective of in-house timesharing in many cases.

- Of the special capabilities identified:
  - The primary reason is proprietary software
  - Network and data bases were also important.

- Economic climate is an important factor in conversion:
  - Recession reduces demand and causes timesharing costs to be examined
  - Recovery spurs demand but provides resources for conversion.

- Users are integrating timesharing with standard applications. This requires access to in-house data files which is a major problem facing timesharing services vendors.

2. CHARACTERISTICS OF IN-HOUSE SERVICES

- Over 70% of internal services were based on IBM computers, few of which were dedicated to timesharing. TSO is the most frequently used timesharing software vehicle.

- Overall, a third of respondents reported having dedicated timesharing systems.

- Respondents have upgraded their timesharing computers in almost every case since initial operation.

- General characteristics were:

  - Reported response time was less than 5 seconds in most cases; less than 20% of respondents reported it less than 1 second

  - Availability was often reported as 24 hours a day for 7 days a week

  - Most respondents reported reliability (up-time) in the 98% to 99% range.

- Over two-thirds of organizations do not have a separate timesharing function in their EDP department.

- The level of support provided by these functions is less than available from outside services but not completely out of range. End users are expected to be more responsible for their own needs but are generally satisfied with the support provided from the in-house group.

- Two-thirds of respondents reported integrating non-timesharing applications with timesharing since establishing a timesharing function.

3. EVALUATION AND DECISION PROCESS: REASONS FOR CONVERSION

- The major reason for conversion of external timesharing is economics:

  - Internal costs are perceived to be 50% of external costs

  - Data storage costs, in particular, are perceived to be "excessive."

- Control and in-house compatibility are also strong reasons for conversion.

- Of increasing importance in the establishment of in-house timesharing and conversion of outside timesharing are:
  - file data security
  - limited timesharing services features such as line speed
  - limited data/file access and transfer capability using timesharing services.

- When external timesharing is examined, respondents found:
  - certain costs are perceived to be too high
  - systems operating in timesharing mode which could be more economically operated differently
  - some poorly structured, coded, and documented systems which have been hurriedly implemented and not cleaned up.

- The EDP department is the single dominant function in:
  - establishing the in-house timesharing function
  - converting timesharing services in-house.

- For conversion, however, the decision maker is generally not EDP alone but involves general management, committees, and/or other groups. User involvement is generally limited.

- Most of the EDP organizations involved have their own financial functions that perform cost analyses, to the extent they are used. The corporate financial functions do have a role more frequently in conversion. They also have an approval function related to the establishment of a timesharing function.

- Internal and external consulting groups sometimes initiate the move to an in-house service.

- For 75% of respondents, conversion activities were completed within two years of first consideration:

  - Establishment of an in-house function will take 6 to 9 months in future from first consideration

  - Significant conversion will take a further 6 to 9 months.

- The role of the hardware vendors was not regarded as very important in the evaluation and decision process. Most respondents felt the responsiveness of their hardware vendor to their timesharing needs was good.

- Most respondents raised the conversion issue with their timesharing vendors when it was first considered:

  - Vendors were not overly concerned

  - Heavier marketing to end users resulted

  - Discounts and repricing systems were offered.

- The attitudes of timesharing vendors increased the conversion emphasis.

- The standard timesharing salesperson is, by most accounts, unable to compete once the issue of timesharing is raised to the EDP manager or corporate management level.

- Less than 25% of respondents made a formal study prior to converting timesharing in-house.

- Since user involvement is generally limited, vendors often do not know

that an in-house system or conversion is being considered until it is too late.

- Almost 50% of respondents would have considered the alternative of an "equivalent" system from a timesharing vendor. Far fewer would consider it now.

4. COSTING APPROACHES AND MECHANISMS

- Over two-thirds of EDP managers reported that they used full costing in setting up their internal timesharing function. However, only half of these were able to report cost breakdowns.

- Financial officers reported that incremental costing was used more frequently, but they represented only a small proportion of the sample.

- Full costing, as opposed to incremental costing, will make little difference between selecting in-house and external timesharing services.

- The average relative cost of the hardware is over 50% of the total cost of the timesharing function; when the function is integrated with EDP, the hardware cost is almost two-thirds of the total.

- "People cost," associated in in-house timesharing, averages about 30%. The level of support provided is relatively low compared to external services and compared to standard EDP.

- Respondents are sensitive to pricing questions:

  - About half the respondents use billing algorithms

  - Others "distribute" costs to users or don't charge them at all.

- Conversion costs are not a major factor in considering conversion; they are usually underestimated.

5. PLANNED AND ACTUAL IN-HOUSE TIMESHARING SERVICES

- Almost 60% of end users interviewed preferred their in-house service to the outside service; only 25% preferred external timesharing services.

- The main reason for preference was lower cost from the internal service. All respondents reported lower costs or increased use for the same or greater cost.

- End users ranked response time, reliability, and availability higher from the outside than inside. EDP managers also felt outside services were "better" than in-house.

- End users ranked support, features and expansion capability better on the inside than outside.

- INPUT projects that the internal groups will improve in the first group of parameters and, thus, the "gap" will probably increase between the internal and external services.

- There were significant changes in timesharing use after conversion:
  - CRTs and intelligent terminals increased their use
  - Higher line speeds were used
  - Language use changed; PL/1 use greatly increased.

- There is evidence of a continuing battle between many EDP departments and their timesharing users.

- When respondents received or prepared formal proposals for timesharing functions, more of them reported achieving better than expected performance rather than worse than expected.

- The worst performers were undoubtedly non-dedicated IBM installations trying to use TSO.

- EDP departments have found:
  - pricing of internal services is a problem
  - demand for timesharing has exceeded expectations
  - users require more support than planned
  - increased cost sensitivity for external and internal data processing
  - closer user involvement with data processing.

- Compared to outside services, EDP managers consider they cannot:
  - match the innovative capability of vendors
  - provide the level of service obtainable from vendors.

- Most converted applications continued to operate in timesharing mode.

6. COMPUTER MANUFACTURERS' ROLES

- IBM's strategy is designed to achieve broader objectives than just replacement of timesharing expenditures. It aggressively pushes establishment of in-house timesharing, but not of conversion necessarily.

- IBM does not yet have a good product for remote computing services, particularly timesharing; its approach is fragmented.

- The main thrust is to control the communications-related aspects of data processing.

- Honeywell, on the other hand, has proven timesharing products but has not achieved IBM's success. IBM competes more strongly against the threat of Honeywell than services vendors.

- Honeywell considers specialized carriers, such as Telenet, will provide the network aspect of remote computing services, thus enhancing their opportunity to provide in-house timesharing computers.

- Honeywell is a timesharing vendor.

- DEC is the most active direct vendor of in-house timesharing systems. The consider the demand for timesharing is sufficiently large to support services vendors and in-house groups.

- DEC identifies companies spending $15,000 a month on timesharing as candidates for in-house systems. It considers its proposal acceptance rate quite high.

7. EXPERIENCE OF RCS (TIMESHARING) VENDORS

- Vendors generally consider they have been relatively successful in meeting the threat of large scale systems and that the "mini threat" has not yet materialized.

- Cost was considered the main reason for users moving in-house with "emotion" ranked a strong second.

- Vendors continue to emphasize that hardware vendors and users fail to recognize the true cost of providing service.

- Again, vendors consider that the demand for timesharing is greater than in-house services can meet. However, they are resigned to considerable losses to in-house systems.

- Vendors lack effective monitoring systems to detect and combat potential defectors.

- National CSS is one exception to the rule. Since it has worked with EDP departments over the years, it has been able to obtain several "facilities management" contracts for in-house timesharing.

- Vendors generally are adopting the traditional response to the problem:
    - sell more to end users
    - reduce prices
    - emphasize full costing.

- One of the most positive aspects perceived by vendors is the increasing involvement of end users in EDP.

B. RECOMMENDATIONS

- GE should investigate adopting a two-tier pricing policy for very large users:
    - charge relatively high rates for high "value added" applications which are difficult to convert in-house

- offer a "utility" or "equivalent system" to them with the following characteristics: a 50% price discount; "unbundled" systems, education and applications support; relatively cheap or "free" storage.

- The large accounts should be brought off standard sales incentives so that:
  - applications can be cleaned up
  - the most cost effective processing from the user's viewpoint installed.

- GE should start to work with internal DP departments and corporate management.

- GE should develop and train at least part of the sales force to sell at the corporate management and DP department level.

- Provide easy ways for unsophisticated users to reduce on-line storage costs:
  - storage efficiency (access + packing)
  - elimination of dead on-line storage

- Provide support (for a fee) for easy transfer of applications from external to internal timesharing when user finds it cost effective to do so.

- Provide facilities for effective cross-access of data between external timesharing system and user's internal timesharing system:
  - data base access and management software
  - IBM compatible (direct or through transparent conversion).

- Research and develop data transmission and analyses techniques for improved user data transfer cost effectiveness:
  - error detection and correction
  - automated data analysis

- Offer increased data transfer rates:
  - cross transfer of data
  - data concentration and rapid transmission
  - greater than 4800 bps.

- Investigate providing on-site, facilities management of computers tied into GE's network. These may be large minicomputers. Also, look at using minis or controllers for in-house storage that can be accessed through GE's network, thus providing access to users' files without taking the data off-site.

- By the time users get to evaluating outside timesharing, it is too late to compete effectively. GE must have an "early warning" system and transfer accounts when they become sensitive, not when they start looking for equipment.

- INPUT considers there is a major opportunity for GE to work with users and DP departments in major companies to obtain not only timesharing work but also standard EDP business through the service capability. Increased user involvement in EDP will support this.

III. ANALYSIS OF RESULTS OF USER RESEARCH

A. DATA PROCESSING MANAGERS

1. CHARACTERISTICS OF TIMESHARING CONVERSION

a. Timing of Conversion

- Based on the results of this survey, the majority of companies of the size considered have, or will shortly have, in-house timesharing functions. Of the more than 70 companies contacted, fewer than 20% did not have, nor were evaluating, an in-house system. The sample was considerably skewed because of its selection criteria, so such a high penetration would not be expected over all equivalent sized organizations.

- As stated in the Introduction, almost all organizations with an in-house timesharing function have converted outside timesharing to it. However, this has been done over several years, in many cases, with additional work added to the in-house system.

- Several companies of the 15 that declined to participate did so because they were now considering conversion of outside timesharing to an in-house

system and regarded it as a sensitive issue.

- This sensitivity was emphasized during the research. Few respondents would provide any material on their conversion process or their pricing. The little material that was made available was only obtained because of personal contacts INPUT interviewers have with some users.

- As shown in Exhibit III-1, the 25 respondents who gave amounts and years when converted for outside timesharing would have accounted for over $10 million in revenues in 1977.

- This figure is based on their use of timesharing remaining constant since it was converted. In fact, as shown in Exhibit III-2, the loss is far more dramatic when potential account growth is taken into consideration. The figures given were obtained from the respondents' dates and amounts of outside timesharing converted, and growth rates since conversion.

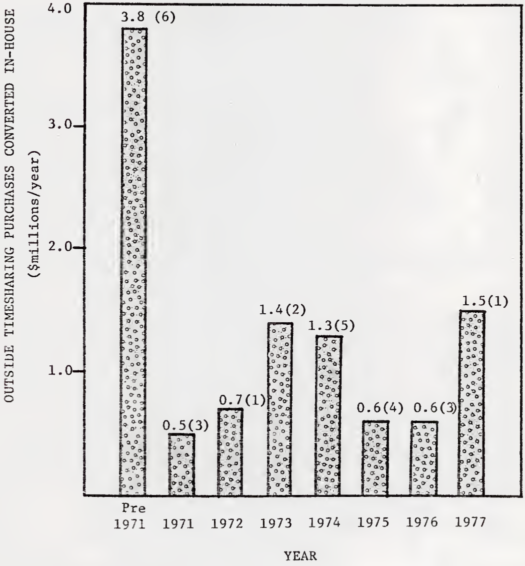
- The trebling in the use of timesharing reflected in Exhibit III-2 is important from two aspects:

  - it shows the basic demand for such services from end users, and
  - it demonstrates the "opportunity" loss associated with the real loss to vendors when outside timesharing is converted in-house.

- The conversion process usually takes time as demonstrated by Exhibit III-3 which gives counts of respondents converting timesharing in any one year. This also shows that, for the companies sampled,

EXHIBIT III-1

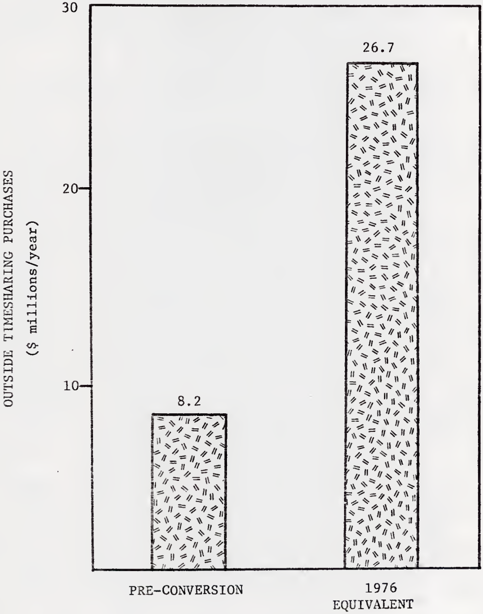
RESPONDENTS' CONVERSION OF OUTSIDE TIMESHARING BY YEAR



Total number of respondents - 25
Figures in parenthesis are number of respondents reporting in each year.

EXHIBIT III-2

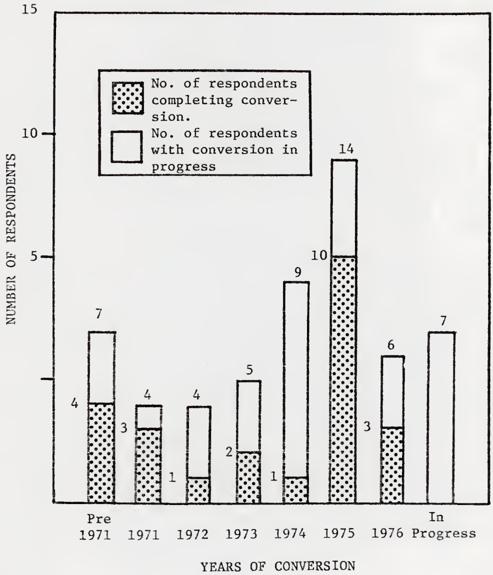
TIMESHARING REVENUES LOST TO VENDORS FROM REPORTED CONVERSION



BASED ON 17 RESPONDENTS

EXHIBIT III-3

RESPONDENTS' CONVERSION OF TIMESHARING BY YEAR



77% had converted outside timesharing in-house by 1976.

- The peak year for such activity was 1975 when a third of respondents completed their conversion activity. As shown, much of this conversion effort was started in 1974.

- For several reasons it appears that there is a strong relationship between the economic cycle and conversion of timesharing in-house:

    - external expenditures become highly visible when there is a business downturn

    - restrictions on personnel growth and generally reduced business levels cause computer capacity to be available which would otherwise be used for normal business growth.

- This is confirmed by the analysis of the year in which respondents first considered converting outside timesharing to in-house as shown in Exhibit III-4. A further factor affecting the tendency to consider conversion is the availability of software for in-house timesharing use; TSO and its extension into VS from IBM have coincided with the pressure to move in-house.

b. Length of Time Taken for Conversion

- As far as elapsed times for the various steps in the decision process are concerned, Exhibit III-5 shows that the period from the start of evaluation of conversion to a decision is the most well-defined with an average span of about 6 months.

EXHIBIT III-4

YEAR WHEN RESPONDENTS FIRST CONSIDERED TIMESHARING CONVERSION

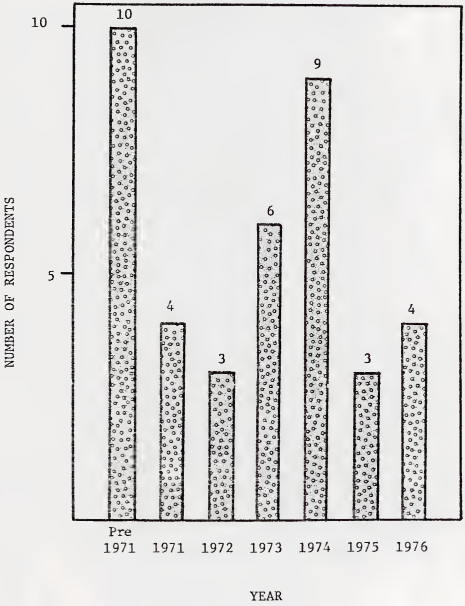
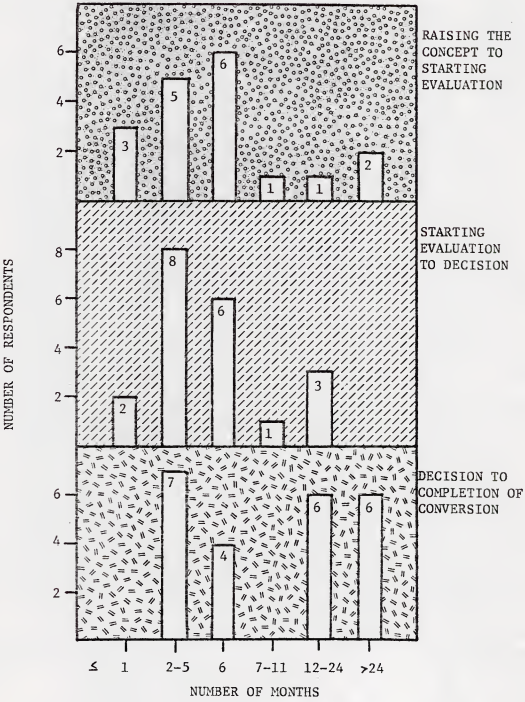


EXHIBIT III-5

RESPONDENTS' ELAPSED TIME FOR STEPS IN CONVERSION PROCESS



- The period from initial consideration to starting the evaluation is normally slightly longer, particularly for some of the earlier conversion efforts. Again, an average period of 6 months is appropriate for this span.

- In combination, the elapsed time from first consideration to decision is about 10 months on average.

- The conversion period varies by the amount of conversion taking place. Some of the larger conversion efforts are still going on after eight years. It also depends on the importance of the conversion effort to in-house groups. Some organizations emphasize the conversion activity while a few seem to convert at a leisurely pace.

- As shown in Exhibit III-6, 75% of respondents had completed conversion within two years of first consideration. The average total elapsed time, including three very large ($1.5 million per year) conversion efforts still under way, is about 30 months; without these three the average is about two years.

- However, the elapsed time for these stages seems to be decreasing with available user and mainframe vendor experience, so that the total elapsed time for establishment of an in-house function should be estimated at 6 to 9 months, with a further 6 to 9 months for conversion of significant timesharing expenditures.

- All (100%) of the organizations interviewed were still doing outside timesharing. Of the vendors being used, GE again was the dominant vendor as shown in Exhibit III-7. Noteworthy, however, is the relatively

EXHIBIT III-6

RESPONDENTS' ELAPSED TIME FOR TOTAL CONVERSION PROCESS

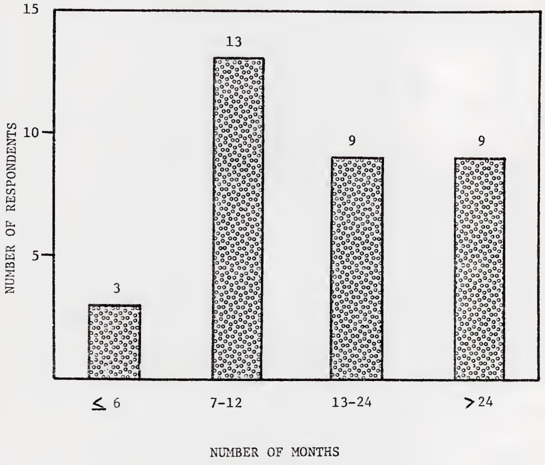
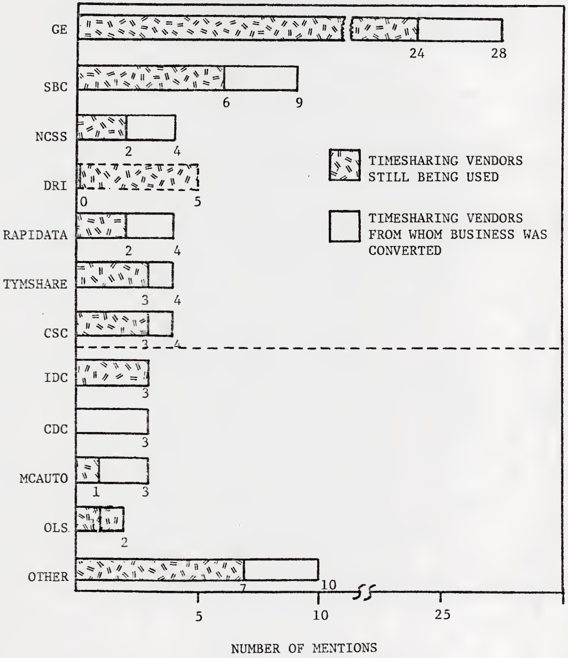


EXHIBIT III-7

TIMESHARING VENDORS AFFECTED BY CONVERSION AND STILL BEING USED



strong position of the "data base vendors," DRI and IDC.

2. CHARACTERISTICS OF IN-HOUSE TIMESHARING SERVICES

a. Computer Used for In-House Timesharing

- As shown in Exhibit III-8, 31 of the 43 computers being used for in-house timesharing were from IBM and of these almost half were System/370 Model 168s.

- Only 20% of the IBM computers were dedicated to timesharing as opposed to 75% for the non-IBM computers. Whether or not they were from IBM, over 50% of the computers dedicated to timesharing were purchased, compared with less than 25% for those not dedicated.

- Of the IBM systems dedicated to timesharing, two were 370/168s, one running under VS-PC and the other under VS with RAMIS. Both were purchased machines.

b. Software Used for In-House Timesharing

- IMS was identified as a DBMS run in the timesharing machines in a third of the IBM installations. However, RAMIS was being used in several key installations.

- A particular installation which appeared effective was that with a dedicated 370/145 using VM/370 and RAMIS. This installation is supporting 300 users with about 100 terminals and 7500 sessions per month. The system is now overloaded and the user is moving to a 2 Meg 158.

EXHIBIT III-8

CHARACTERISTICS OF RESPONDENTS' TIMESHARING COMPUTERS

MANUFACTURER	MODEL	NUMBER DEDICATED TO T/S		NUMBER		CORE SIZES	SOFTWARE		
		YES	NO	PURCHASED	LEASED		OPERATING SYSTEM	COMMUNICATIONS	DBMS
IBM	370/168	2	12	2	12	5=3Meg, 9=4Meg	2=OS/MVT,7= SVS,2=MVS,1= VS-PC, 1=IMS	8=TCAM(TSO), 2=BTAM,1=CICS	7=IMS 3=RAMIS 1=Total
	370/158	2	6	1	6	1=1Meg,3= 2Meg,2=3 Meg,1=4Meg	2=SVS,2=TSO, 2=TSO/IMS	2=TCAM,1=HASP 1=CALL 360	2=IMS 1=Total CICS
	370/165		1	1		3Meg	OS/MVT	BTAM	Minerva
	370/155		3	1	2	1=2Meg,1= 3Meg,1=128K	2=OS/MVT,1= TSO/IMS	2=TSO,1=IMS/ DC	IMS
	370/145	1	2		3	1=1Meg,1= 2Meg	VM370,SVS	VM 370,TSO	RAMIS
	360/67	1		1		4Meg	TSS	TSS	—
	360/65		1		1	1Meg	OS/MVT	HASP	
HONEYWELL	6000	1	1		2	1=256K, 1=512K			
XDS	940	1		1					
	SIGMA 9		1		1				
	SIGMA 5	1		1					
DEC	DEC 10	2		1	1				
	PDP 1150	1		1					
	PDP 1170	1			1				
UNIVAC	1100	1	1		2				
CDC	6600	1		1					

They originally had a 360/67 with CMS and so have moved along a path which has provided for a four-fold expansion.

- As far as IBM operating systems are concerned, respondents are not moving to MVS as fast as IBM would no doubt like. SVS is currently used in a majority of models (145, 158, 168) with OS/MVT HASP still present in about 15% of the IBM installations. The performance characteristics of MVS do not appear attractive to most managers right now. There was, however, one installation running MVS Release 3.7.

- TSO was being run in almost half the installations often with TCAM under VS. BTAM had relatively little use. CICS, TSS, and IMS/DC were being used in a few installations.

c. In-House Timesharing System Changes

- Based on the above considerations, the respondents were not casually considering timesharing; they are in it to stay:

    - a third of the respondents have a dedicated timesharing systems, half of these are purchased

    - the systems have the core size to be effective processors (9 of the 168s have 4 Meg storage)

    - the operating systems are timesharing specialized or oriented

    - data base management systems with timesharing capabilities are being used extensively.

- In support of this, almost 80% of respondents have made changes

to the in-house system since it was originally specified for timesharing. Of these, 11 respondents have upgraded their computers, sometimes significantly; for example, a 370/145 to a 370/158 to two 370/158s, or a GE 637 to a Honeywell 6080, or a 360/67 to a 370/145 to a 370/168.

- Other changes made commonly were to add disk and communications controllers. Disk space was particularly important for TSO users.

d. Service Level of In-House Timesharing

- The response time quoted by respondents varied appreciably, as shown in Exhibit III-9. Generally, the dedicated, non-IBM systems were the best performers. Several 168 users were expecting response times from 5-20 seconds, although this was for first "ready" rather than continued operations.

  Many respondents would not commit themselves on response time but made statements such as "varies," "satisfactory," "good," and "eratic." This was particularly true of IBM installations.

- As far as availability is concerned, Exhibit III-10 shows that almost half the respondents schedule timesharing to be available 24 hours a day, 7 days a week. Since most of the systems were not duplexed, this hardly seems credible given normal maintenance requirements. In fact, one respondent admitted the system was only available 40% of the time. On the other hand, at least one respondent felt his availability was better than they had received from the outside.

EXHIBIT III-9

IN-HOUSE TIMESHARING RESPONSE TIME

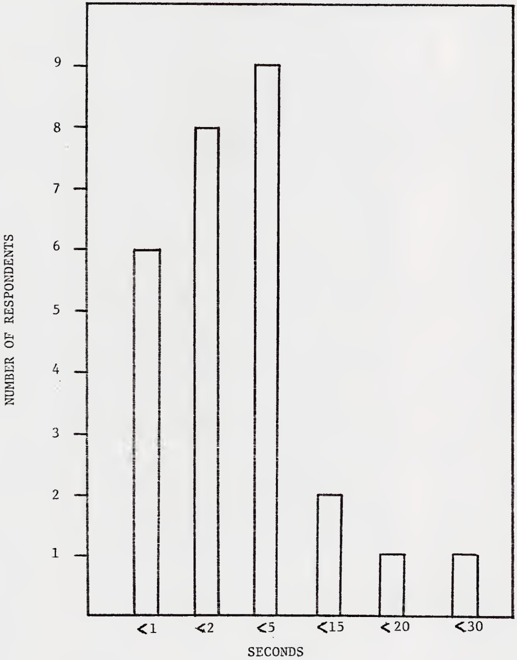
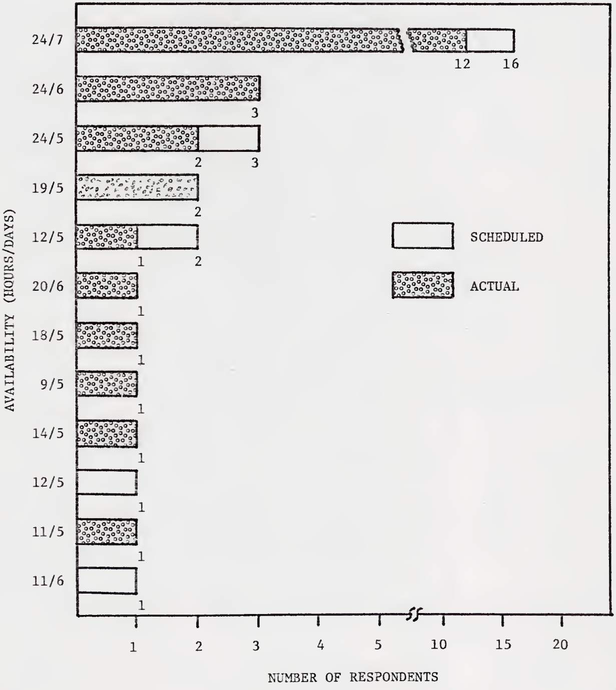


EXHIBIT III-10

RESPONDENTS' HOURS OF AVAILABILITY FOR IN-HOUSE TIMESHARING



- The reliability obtained by in-house timesharing functions was relatively low compared to commercial installations; only about 10% of respondents had a reliability of 99.5% or better, as shown in Exhibit III-11.

- When looking at improvements or expansion plans, only one user stated that he would improve reliability and availability. Other expansion plans were primarily in the equipment area and are similar to the changes given above, namely, upgrading computer (5 plan to do this), add disk, and memory. However, several minor points are apparent which could be indications of trends:

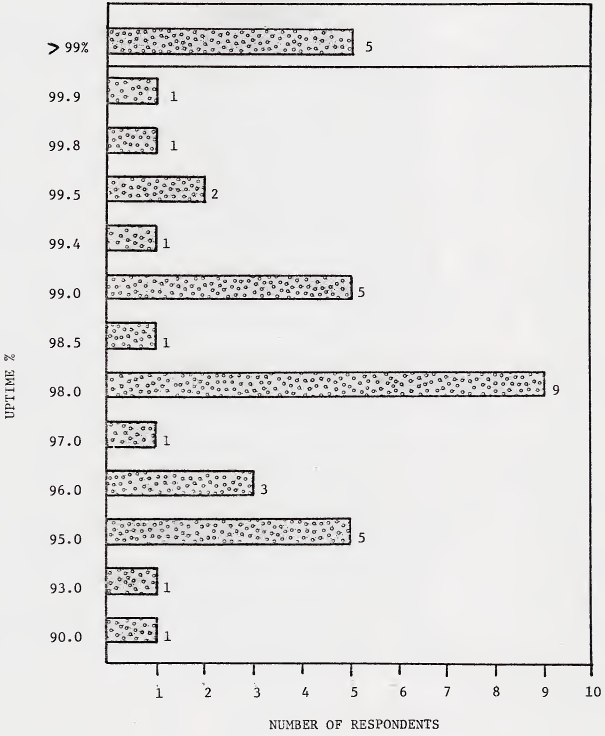
  - one respondent is adding interactive graphics capability (another has done so)
  - several respondents are evaluating VS-PC, especially for the "technical community"
  - a respondent is replacing disks with a disk system from Modcomp using a minicomputer disk controller
  - because of capacity, a Honeywell 6080 user is going to sell timesharing.

e. <u>Organization and Support Levels for In-House Timesharing</u>

- Less than a third of respondents had separate timesharing functions in their DP organization; the remainder integrated it with normal DP. There was some indication that banks are more likely to establish a separate function than other organizations.

EXHIBIT III-11

RESPONDENTS' IN-HOUSE TIMESHARING RELIABILITY



- Although respondents with a separate timesharing function are more likely to have a dedicated timesharing computer than those with an integrated function, still over half of them use computers which are not dedicated to timesharing.

- In the installations with separate timesharing functions, the numbers of people allocated are small in comparison with the workload as shown in Exhibit III-12. This is in spite of grossly overestimated figures for the workload from some respondents.

- Taking actual cases given, the average workload supported by each person would be as follows:

  - operators, $1.67 million per person or $0.72 million per person without the two most extreme "workloads"

  - systems analysts/programmers, $0.72 million per person, or $0.23 million per person without the two extreme cases

  - support, $0.67 million per person, or $0.27 million per person without the two extreme cases.

- In most cases additional support is available from the main DP organization. In several cases, "pooling" with this DP organization takes place so that it is virtually impossible to break out responsibilities accurately.

- This is further compounded when the timesharing functions are integrated fully with DP. Exhibit III-13 shows that over a third of all respondents' timesharing installations were without dedicated

EXHIBIT III-12

PERSONNEL DEDICATED TO RESPONDENTS'

SEPARATE TIMESHARING FUNCTIONS

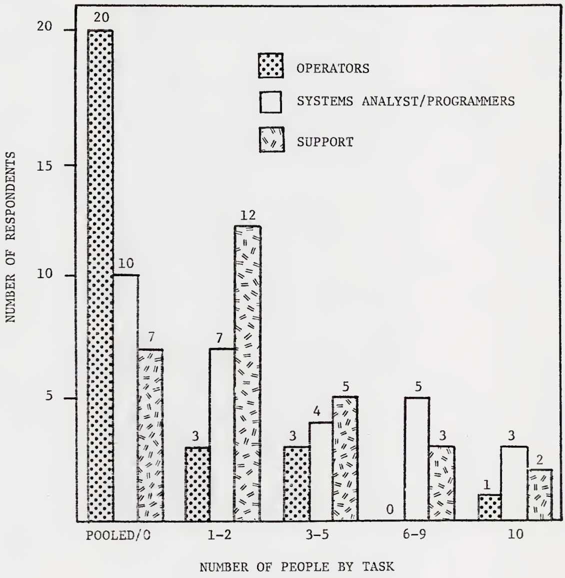
RESPONDENT NUMBER	OPERATORS	SYSTEMS/ ANALYSTS PROGRAMMERS	SUPPORT	LEVEL OF WORK * ($Millions)
40	3	5	7	$1.50
35	Pooled	Pooled	4	.11
55	3	6	3	.40
60	1	5	-	1.20
42	4	6	1	3.00
54	2	0	2	.50
27	Pooled	35**		1.00
32	1	4	3	2.40
43	6	6	12	10.00
45	4	7	11	20.00
TOTAL	24	56	60	$40.10

* Level of work is the equivalent external cost, as estimated by respondents, of the work performed by the in-house function

** Divided equally for totals.

EXHIBIT III-13

PEOPLE DEDICATED TO TIMESHARING SUPPORT OVER ALL RESPONDENTS



analyst/programmer support.

- Most installations have a support function for internal timesharing, although it is usually only 1 or 2 people. Often they are responsible for liaison and tasks such as issuing and maintaining manuals rather than development and operational support. The amount of increase from when there was outside timesharing only is often only one or two people.

- Several respondents in utilities mentioned that each user group was "responsible for its own thing." Each user department had its own support function.

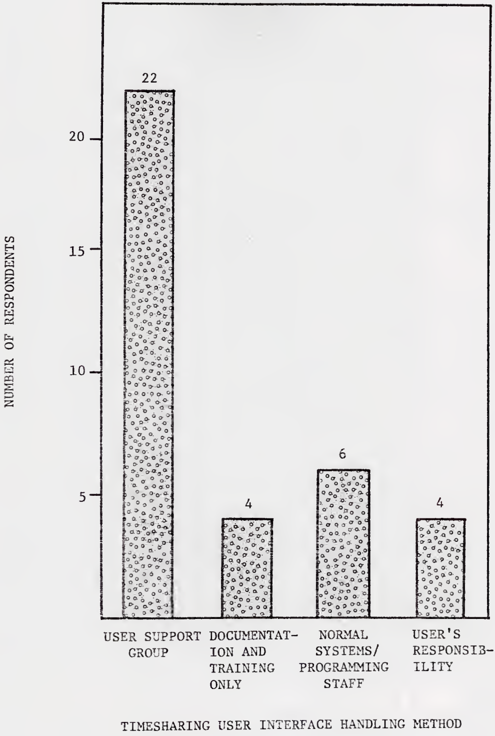
- Exhibit III-14 shows that most interface with users is handled by a user support group dedicated to the timesharing function, as described above, or by a group within the normal DP function which has that responsibility, but is not dedicated to it.

- One respondent stated that he regarded timesharing as a "utility" and the user was therefore responsible for its application. Several respondents, on the other hand, were expanding or planning to expand their user support groups. This was as a result of increased demand, to a certain extent, but, more importantly, also resulted from a realization of the necessity to improve "service."

- INPUT concludes that in-house timesharing support groups will increasingly be independent functions and will grow to provide more service to users. At the same time, users have a lot of expertise

EXHIBIT III-14

RESPONDENTS' HANDLING OF INTERFACE WITH TIMESHARING USERS



held over from outside timesharing relationships so that the level of support required for conversions is considerably less than that for new timesharing activities.

- One bank respondent, attacking a \$1.5 million per year outside timesharing expenditure, is establishing a separate timesharing function with 15 people. This group will consist of two operators for a dedicated DEC 20 or 370/145, five systems analysts/programmers, and 7 support people; they will support up to 70 users. This is one of the better planned activities that we discovered, but the support coverage is still "thin." The only reason that it will not be overwhelmed is the experience users already have with outside vendors.

3. EVALUATION AND DECISION PROCESS; REASONS FOR CONVERSION

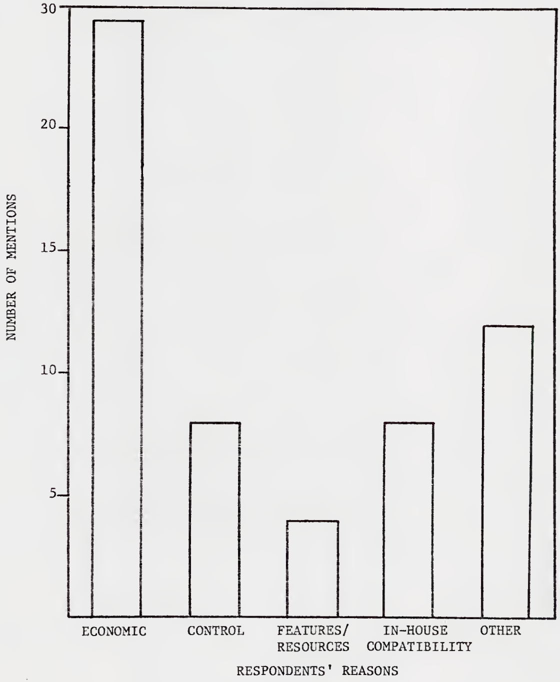
a. Cost is the Reason for Going In-House

- By far the most important reason for conversion offered by respondents is "economics" as shown in Exhibit III-15. Comments such as "Timesharing costs rising fast," "Keep money inside," "Stop timesharing cost growth," "Money!" abound. Almost every respondent advanced a cost-related reason: several of them contrasted "out-of-pocket" costs with internally distributed costs.

- However, cost is not the sole reason. Control and in-house compatibility were also advanced as strong reasons for conversion.

EXHIBIT III-15

RESPONDENTS' REASONS FOR CONVERTING TIMESHARING IN-HOUSE



- In addition, many users felt that in-house timesharing was becoming cost effective for them and that they had the resources necessary to support such a function. This last point ties in with the capacity availability many large system users had during 1974 and 1975 because of the recession.

- One user justified conversion by defraying the cost of a second system required as back-up to a message switching system. This is one case where incremental costing is justified.

- The most cogent reason for conversion advanced was "Management (the President of the company) edict!"

- Another user mentioned that he was paying $20,000 per month for an outside service which the in-house group would do for "free." Since there are few operational entities to which $250,000 on the bottom line is not very significant, the user selected the in-house alternative.

- On the other hand, one of the responding data processing managers without an in-house timesharing function felt that they would obtain one because this was the first year user groups were being charged for the outside timesharing they used; to this point corporate had picked up the bill. A corporate planning analyst felt they would continue outside, however, because of their wish to avoid creating another internal DP bureaucracy.

b. Reasons for Continued Use of Outside Timesharing

- As shown in Exhibit III-16, the primary reason for the continued use of outside sources by organizations with established in-house timesharing functions was proprietary software, with the availability of a network mentioned only half as often.

- As far as software is concerned, however, many users examine available software packages to see if they can economically perform the application in-house by acquiring a comparable package. For complex software with a relatively low level of use this will simply not be worth doing in many cases; for example, a user of numerical control services at $20,000 per year felt it was not worth looking at converting inside.

- Therefore, the two factors that affect the extent of use of timesharing services based on proprietary software are:

  - availability of a comparable software package

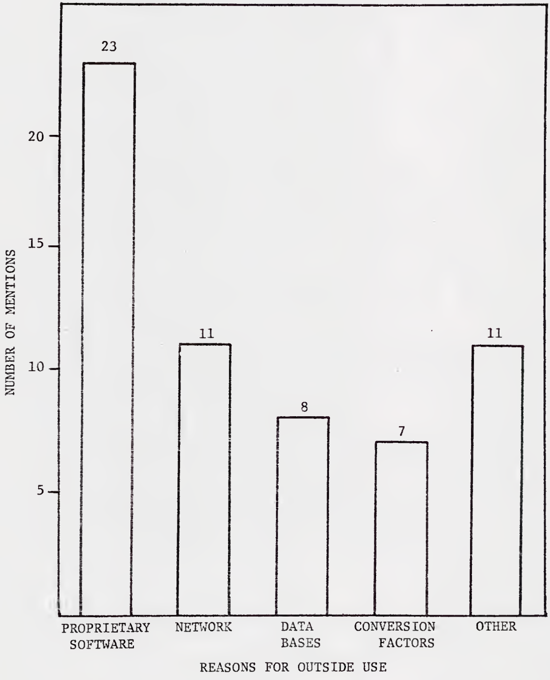
  - cost of acquisition of, and conversion to, the package in an internal system.

- Financial modelling and planning on GE, CSC and others was the most frequently mentioned proprietary software dependent service.

- As far as the network is concerned, this was mentioned in the context of using GE in all cases except one. Additionally, over half the respondents giving network availability as a reason wanted access to an international network.

EXHIBIT III-16

RESPONDENTS' REASONS FOR CONTINUED OUTSIDE TIMESHARING USE



- Data bases were another key reason for outside use. Here DRI was particularily mentioned, and to a lesser extent IDC and CSC with its chemical abstracts data base. Here there were no indications of attempts to convert inside.

- The often serious struggle between users and the DP department over conversion is reflected by some of the answers included in "conversion factors." Several DP managers responded that "Users won't convert," or that there were "Organizational problems associated with conversion."

- Additionally, however, there were a group of DP managers to whom conversion was not the main reason for establishing the function, so that the emphasis on conversion was absent. In these installations reasons such as "Not yet converted," "Not worth converting" were prevalent.

- These respondents were those who established internal timesharing to provide expansion of internal capability and to control future timesharing growth. About 25% of the respondents fitted this category.

- The "other" reasons mentioned were:
    - one time applications, 3 respondents
    - features not available in-house, 3 respondents
    - large computation, 2 respondents
    - speed of implementation
    - knowledgeable vendor staff
    - "well sold"

- Conspicuous by its absence, is the reason of "cost" or "economics." Not one respondent stated that it was more economical to use outside timesharing for anything. The nearest any respondent came was to allow that certain applications were "not worth converting."

c. Respondents' Comparison of Internal and External Costs

- Late in the interview program, respondents were asked what kind of price discount would have to have been made by the vendor in order to compete with the in-house system. The general answer was 50%.

- A couple of respondents volunteered that the internal timesharing costs were about a tenth or a sixth of what it would cost from an outside vendor. However, one of these respondents admitted that they had no price schedule and that when one was instituted, they would be at about 50% of GE's rates.

- However, discounts in themselves will not stop the establishment of in-house timesharing functions. As one respondent put it: "We would still have come inside because of other benefits."

d. Users' Relationships with In-House Timesharing

- Once an in-house timesharing function is well-established, the use of outside timesharing by respondents is as follows:

  - 20% operate in a completely decentralized mode and users make their own decisions; these respondents don't know what new applications are being performed.

- 10% have limits under which users can go outside, either directly or through DP; these limits vary from $500 per month to $200,000 per year.

- 70% have some form of centralized management or control; of these more than half have let out contracts to the outside since establishing their internal timesharing functions; the types of applications and the reason for doing them outside were as described above.

• Of the 70% of respondents having some form of centralized control, about half have a review and advisory capacity. As one respondent stated: "We serve in an advisory capacity; we review requests, purchase all terminals, and pay all the T/S bills; about 95% of the applications are done in-house."

• Again there is considerable evidence of a continuing battle between users and the DP department. "User departments must go to centralized groups to initiate T/S use--it took us a lot of pain to get this implemented," stated one respondent.

• As far as approval of outside purchases is concerned, data processing departments are responsible in 90% of the respondents with centralized control. A small number must go to "management," "the controller," "management review committee," or a similar level for approval of outside purchases, especially for large ones.

e. Participants in the Move to In-House Timesharing

- As shown in Exhibit III-17, the DP department is by far the most important factor in starting the move towards establishing in-house timesharing and also towards conversion of outside timesharing. In the latter case, however, other organizations and factors come into play more often.

- Of the "other" factors mentioned, a "Big 8" accounting company and a third party leasing company were identifed as starting the move.

- In three cases management research or management science groups initiated the move and then transferred it to DP.

- In only two cases did respondents identify the move as initiating solely from financial organizations.

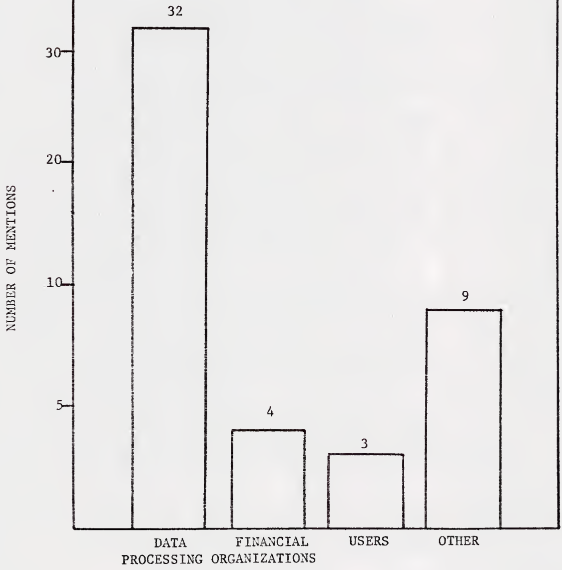
- In only a third of respondents did hardware vendors make a "pitch" for conversion; several other respondents stated that it was purely internal so that the vendors never had the opportunity to do so.

- The respondent that had the "Big 8" accounting firm initiate the move stated that they had prepared an RFP so that the hardware vendors did not have a chance to "pitch" conversion but did prepare a formal proposal. Otherwise, formal proposals were obtained from hardware vendors in less than 25% of the cases.

- For those respondents who received formal proposals or who "developed" one themselves, the resulting performance varied considerably:

EXHIBIT III-17

INITIATORS OF MOVE TO IN-HOUSE TIMESHARING



- 43% performance was better than expected
- 21% performance the same
- 36% performance worse

• All the "worse" performers were IBM installations mainly trying to use TSO. Comments included:

  - "It has not met expected growth" -- 168 user
  - "Higher cost, lower performance" -- 168 user
  - "TSO system uses greater resources than expected" -- 168 user
  - "Poor service of TSO" -- 165 user
  - "TSO limited capability" -- 158 user

• The only IBM-based timesharing function where the performance was better than expected was a dedicated 4 Meg 168-III using RAMIS and TOTAL as well as other non-IBM software under VS.

• Respondents generally felt that the responsiveness of their hardware vendor to their needs as T/S suppliers was as follows:

  - "Good" -- 16 respondents
  - "Medium" -- 9 respondents
  - "Poor" -- 4 respondents

All 4 respondents ranking it "poor" were IBM System/370 Model 168 users operating in a non-dedicated mode.

• However, the successful IBM users with dedicated 168s, 158s, or 145 ranked the IBM support received as "good" and sometimes "very good!"

• Almost all respondents required zero or minimal support from the hardware vendor for conversion.

f. Timesharing Vendors' Response to In-House Timesharing Development

- When respondents first considered this, two-thirds of them raised the issue with their timesharing vendors. Few timesharing vendors were surprised and no great excitement resulted.

- Indeed, the timesharing vendors' reaction was generally unconcerned; most of them did little or nothing. Respondents stated they were "resigned," "not concerned," "did nothing," etc. Indeed, some vendors were cooperative.

- Positive actions taken by timesharing vendors included:
  - heavier marketing
  - building user contacts and business
  - discounts or repricing

- One respondent stated there were two kinds of reaction by their vendors:
  - nothing, it was ignored
  - very cooperative, but each wanted to be its sole source for remaining T/S.

- Only less than half responded with a counter proposal. One respondent stated that: "GE submitted time/volume discount plan," "CSC submitted volume discount" and "SBC had no reaction."

Other respondents indicated, especially where there is decentralized T/S control, that vendors went on dealing with users. As one respondent remarked: "There are plenty of places in this oil company where they can sell their services."

- There is no doubt that outside timesharing vendors aggravate the emotional issue by ignoring or denigrating the efforts of in-house groups to set up timesharing functions. The vendors forget that they will be victims of the "Chinese water torture" treatment in that the in-house DP department is there all the time and will eventually establish a capability if it applies necessary resources to it.

g. <u>Decision and Evaluation Process for In-House Timesharing</u>

- The data processing department and its management are the key decision points for the establishment of in-house timesharing functions, as shown in Exhibit III-18. They are relatively less important in the decision to convert timesharing inside, since:

  - internal timesharing in an organization is often first used by the DP department itself for program development; indeed several respondents identified this as the overriding reason that they wanted it.

  - the decision to convert timesharing involves user departments over which DP has no jurisdiction.

- In fact, less than half the respondents reported that the data processing department made the decision to convert timesharing inside.

- Few respondents made a full, formal study prior to deciding to convert in-house, as shown in Exhibit III-19. Almost half the respondents only did a limited amount of study, such as: "Estimated costs," "Had performance discussion of inside versus outside," and "Made a functional evaluation; looked at hardware problems."

EXHIBIT III-18

RESPONDENTS' DECISION MAKERS ON INTERNAL TIMESHARING

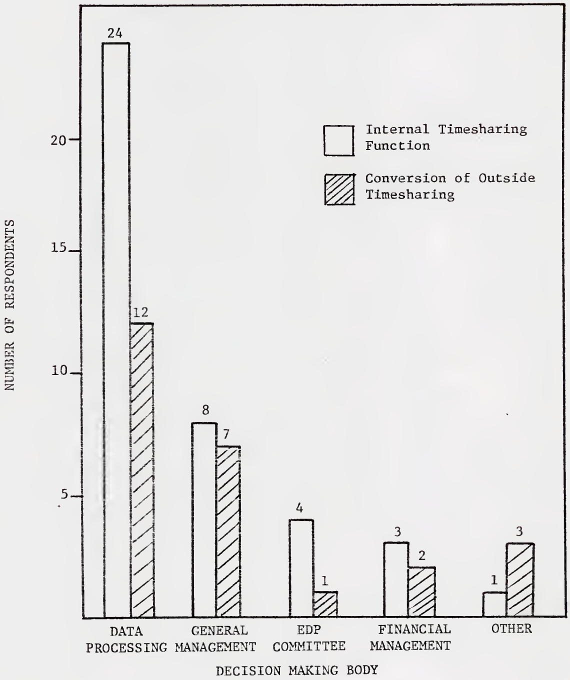
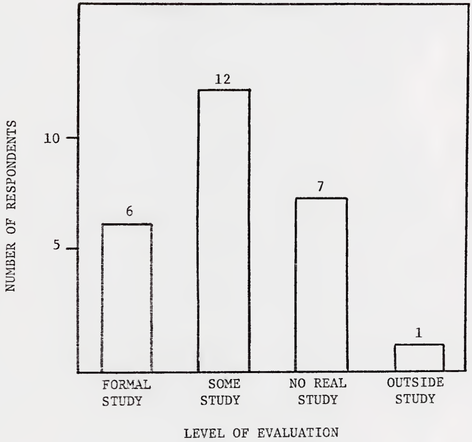


EXHIBIT III-19

EXTENT OF RESPONDENTS' EVALUATION PROCESS



- One factor affecting the extent of the evaluation process is that many IBM users installed interactive program development first through TSO or other means and then attacked timesharing for users.

- Only one respondent mentioned benchmarking.

- Another mentioned that their in-house timesharing function came about through the purchase of a timesharing company!

- As shown in Exhibit III-20, the DP department made unilateral decisions on timesharing in almost a third of respondents' organizations. Only six organizations involved users in their timesharing evaluation process.

- Apparently, only two organizations fully involved users, planning and DP in the evaluation process together with financial or management representatives. These organizations carried out detailed studies.

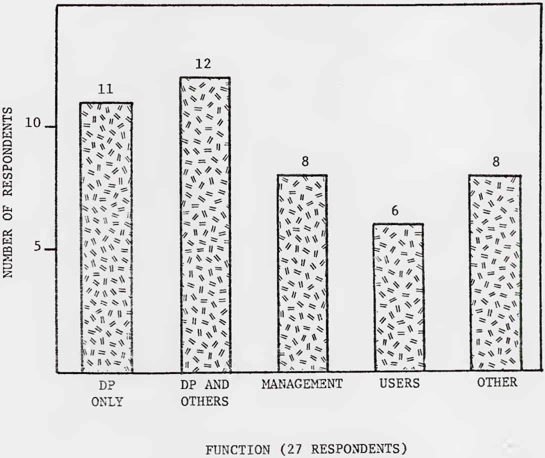
- The extent of the evaluation process and the involvement in it was described by one respondent as follows:

  - Management: "How much do we spend for outside timesharing?"
  - Respondent: "Between $250,000 and $500,000 per year."
  - Management: "Can it be done inside?"
  - Respondent: "Yes."
  - Management: "Do it!"

- Management involvement in the evaluation process ran the gamut from the President of the company to the "Management Services Department."

EXHIBIT III-20

FUNCTIONS INVOLVED IN RESPONDENTS' TIMESHARING EVALUATION PROCESS



- The other groups involved were:
  - financial -- 4 respondents
  - planning -- 2 respondents
  - IBM
  - Colorado School of Mines

h. Factors Involved in Evaluation Process

- When asked to rank factors that were important in evaluation, almost a third of the respondents gave "cost" a perfect score of 10 in their ranking. Cost and control were thus ranked first and second as shown in Exhibit III-21.

- Other highly ranked factors advanced by respondents included:
  - "more convenient user access to in-house computers" -- rating of 10
  - "response time" -- rating of 8
  - "service level" -- rating of 10
  - "business systems data base access" -- rating of 9

- Few respondents used any weighting scales in their evaluation. "Payback" and "dollars and cents" were two scales suggested. Another respondent stated they had a 1-10 rating scale on factors similar to INPUT's question but considerably more detailed.

i. Consideration of Fixed Price Timesharing Contracts

- As shown in Exhibit III-22, 40% of respondents would have considered, or consider now, a fixed price T/S contract providing the equivalent of

EXHIBIT III-21

RESPONDENTS' RANKING OF FACTORS CONSIDERED IN EVALUATION PROCESS

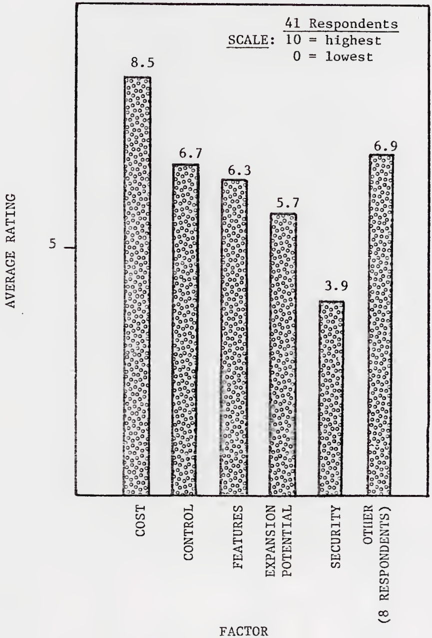
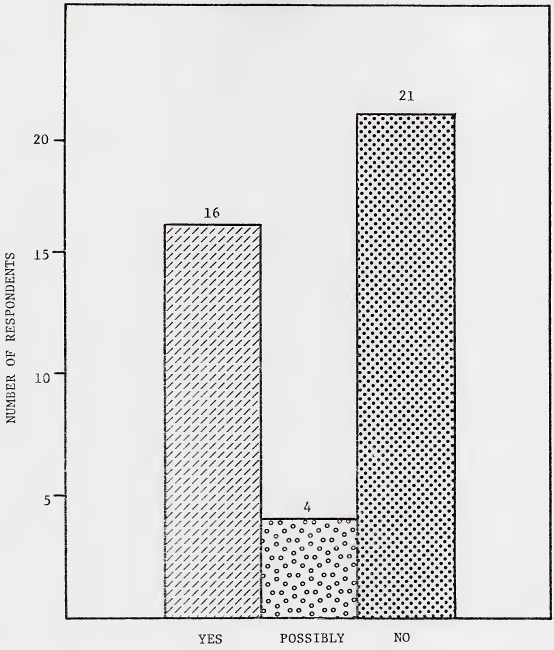


EXHIBIT III-22

RESPONDENTS' WILLINGNESS TO CONSIDER

FIXED PRICE EQUIVALENT SYSTEM CONTRACTS



"WOULD YOU HAVE CONSIDERED, OR CONSIDER NOW, A FIXED PRICE TIMESHARING CONTRACT 'PROVIDING THE EQUIVALENT' OF AN IN-HOUSE COMPUTER?"

an in-house computer.

- Some respondent comments on this key issue are:

  - "Yes, we have this under study. It may be the way to go. We are looking at an FM contract with IDC for a fixed fee."

  - "Yes, would be a possibility in those cases where not using in-house data."

  - "Possibly--but remote because we would still have the hardware in-house. However, in lieu of upgrades, we might."

  - "Yes, possibly attractive. Software capabilities would make this attractive."

  - "Have asked several vendors for such a bid, as an interim solution: GE, Rapidata and others."

  - "Would not consider it now. Privacy and security implications of the Banking Act precludes outside T/S access to data files."

  - "We have had offers but the vendor will not sign a guaranteed performance contract."

  - "Yes, then; no, now! EDS proposed it; costs were too high and no schedule was guaranteed."

  - "No; tried fixed price structure with IDC."

  - "Not now; would have then."

- No respondent would consider such a contract now when they wouldn't before, except one who would consider it for expansion. Once they have the in-house system, respondents who would have considered

it previously, now will not.

- In about 50% of cases, therefore, organizations would consider the alternative of an "equivalent system" from a timesharing vendor.

4. COSTING APPROACHES AND MECHANISMS

a. Distribution of Costs of In-House Timesharing

- The basic costs of the timesharing function are distributed as shown in Exhibit III-23. The average relative cost of the hardware is over 50% of the total cost, and for those installations where the function is integrated with other DP, it is almost two-thirds of the cost on average.

- "Other" costs covered here are primarily communications and terminals, but include software in some cases.

- The proportion of cost of hardware varies considerably as shown in Exhibit III-24. Several respondents with integrated timesharing functions reported that hardware was 90% of their cost. These were large IBM shops with minimal support for timesharing users.

- On the other hand, two respondents each with a dedicated System/370 Model 168 and a separate timesharing function reported hardware costs of only 30%, people costs of 40%, and other costs at 30%. For the level of support provided and the extent of timesharing use, these installations had a reasonable cost distribution.

EXHIBIT III-23

RESPONDENTS' IN-HOUSE TIMESHARING COSTS

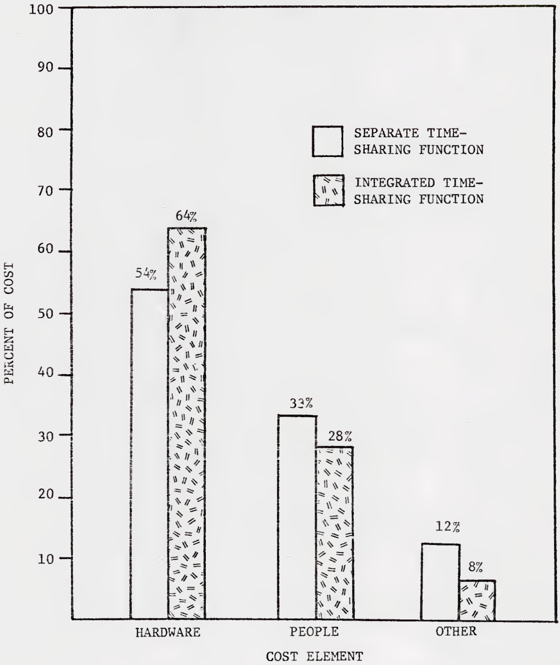
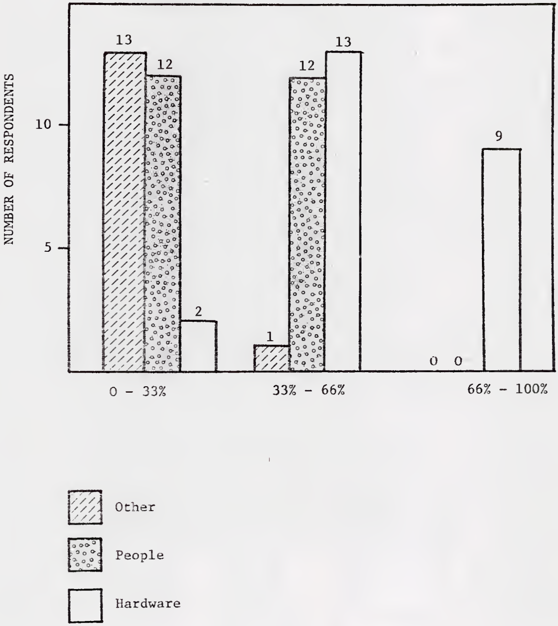


EXHIBIT III-24

RESPONDENTS' DISTRIBUTION OF IN-HOUSE TIMESHARING COSTS



- One of these 2 installations includes in its "other" costs, the contract cost for on-site facilities management of its timesharing function by NCSS. INPUT estimates this contract as worth $400,000 per year to NCSS.

- The relative size of the hardware cost is consistent with respondents' estimation that they were operating at 50% of outside timesharing costs in general.

b. <u>"Full" vs. "Incremental" Costing</u>

- Over two-thirds of respondents reported that they used full costing in setting up their internal timesharing function. However, of these, only half were able to report cost breakdowns.

- In examining the cost breakdown, those respondents with full costing show significantly higher hardware costs:

    - 10 respondents, average hardware cost 64% for respondents with full costing

    - 10 respondents, average hardware cost 50% for respondents with incremental costing.

- Of the respondents with incremental costing, those with dedicated timesharing systems reported slightly higher average hardware costs than those using their main processors.

- Of the respondents providing cost breakdown, only two using full costing had dedicated timesharing systems.

- From the results, it appears that the costing method adopted by an organization:

  - does not affect the perceived difference between in-house costs and outside timesharing (about 50%)

  - affects the proportion of the cost due to hardware by only 15% to 20%.

- Therefore, it is unlikely that the level of effort spent on attempts to get users to adopt full, as opposed to incremental, costing will materially affect the movement of timesharing in-house.

c. Pricing of In-House Timesharing Services

- About half the respondents used billing systems analogous to those of remote computing services vendors. Of the others, a third did not charge the users at all, and the remainder "distributed" costs on some basis, such as usage.

- Exhibit III-25 shows some of the variation in pricing among the respondents for their timesharing services. Many respondents refused to give their pricing schedules; "company private" or similar labels were attached to them. This oversensitivity to pricing reflects an insecurity in this area among many respondents.

- The wide variations in the distribution of internal costs and the charges made to users show that this is an unsettled area for most organizations. Therefore, each situation has to be approached uniquely

EXHIBIT III-25

RESPONDENTS' CHARGES FOR INTERNAL TIMESHARING SERVICES

INTV NO.	SYSTEM	CHARGES			
		CPU/UNIT	CONNECT TIME	STORAGE	OTHER
01	370/168-I	8.5¢/sec.			
02	370/168-III	$1,875/hr.	$10/hr.	$0.50/track/ month	(price list provided)
12	Honeywell 6060	11¢/sec.	$5.50/hr.	$3.75/240K/ month	
15	370/168-III	$4.50/min(?)	$8/hr.	$1.00/track/ month	I/O=$3.60 per K memory=20¢/ 8K/min.
41	370/168-III	(i)84¢/sec. (ii)21¢/sec.	$9/hr. $3.50/hr.	3¢/track/day 1.5¢/track/ day	(i)TSO (ii)APL-price list provided
50	370/158-III				Flat rate connect hour-$45/hr.
54	DEC 10	0.3¢/sec.	$2/hr.	5¢/1000/month	Estimate
56	370/168	$1,300/hr.	None	None	None
58	370/168	——	$6/hr.	——	Would not reveal
59	370/168				$400 per system hour
60	XDS Sigma 5	12¢/unit	$10/hr.		11¢ per I/O access
63	370/155	$300/hr.	$13/hr.	——	

by the outside vendors from a cost competitive viewpoint.

- In particular, based on the survey, at least half the DP departments will not charge users or will merely "distribute the costs," so that it is almost impossible for an outside source to be cost-competitive in these situations from the end users' viewpoint.

- Organizations will often establish timesharing as an internal DP function to do program development. Subsequently, other users are provided services, replacing outside vendors. This is done on a "cost sharing" or "no cost" basis; finally, the DP department establishes a price schedule and starts to operate as a corporate timesharing service. Until this point, the outside vendors are not able to compete on a "cost" basis, and then it is too late!

5. COMPARISON OF PLANNED AND ACTUAL IN-HOUSE TIMESHARING SERVICES

a. Respondents' Evaluation of Their Performance

- Respondents were generally pleased with the performance they had achieved with their internal timesharing function, as partially shown in Exhibit III-26. Of those respondents included in the "good" rank, several felt their performance was "excellent," "very good" or "highly efficient."

- In spite of this positive qualitative assessment, few respondents considered their services better than those from outside vendors. At best, they felt they were equal. The response time is the major problem area, especially using TSO.

- However, several comments were made such as:
  - "marginally acceptable but 50% of the cost of outside"
  - "less responsive but more cost effective."

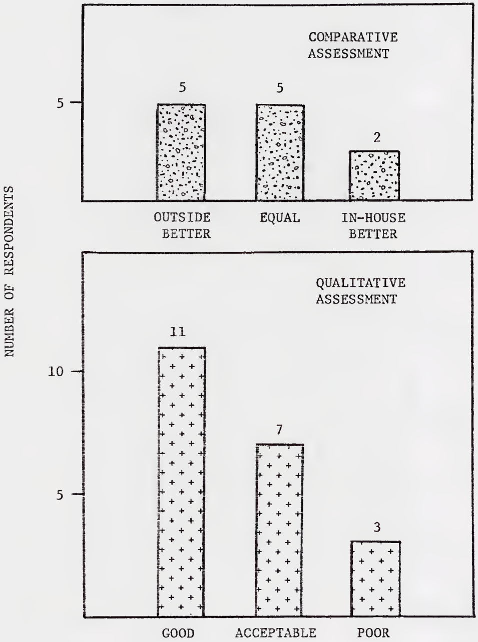
- All 9 respondents identifying cost in performance, felt in-house was cost effective; 3 mentioned costs were 50% of outside.

- None mentioned costs being higher than expected; one stated they were lower.

- From the responses, it appears such installations are likely to be more successful than planned: 3 respondents identified they were overloaded or saturated, and one respondent identified their system as now being obsolete.

EXHIBIT III-26

RESPONDENTS' EVALUATION OF THEIR IN-HOUSE TIMESHARING PERFORMANCE



b. Comparison of External and Internal Costs

- Further analysis of the total costs of internal timesharing after conversion and the level beforehand showed that the decrease in cost was not as large as respondents had previously stated. In fact, it went up in about 30% of the cases while decreasing in 60%; the remainder felt there was no difference.

- However, there are two, other, related considerations:

  - respondents stated that more work was being done than had been done outside; for example, "total costs are the same, but we are doing four times as much work" was a typical response.

  - respondents were comparing costs now with outside costs as much as 8 years ago, when conversion had been accomplished.

- Nevertheless, of 24 respondents giving "before" and "after" cost figures, only 6 felt their total costs were less than 50% of the previous outside costs.

- Several respondents stated it was impossible to compare costs or that comparative costs were not available, one reason being that accounting systems didn't handle it.

- In further comparing costs, 17 respondents reported that their in-house costs were 42% less than the equivalent outside timesharing costs, on average.

- From this analysis, it appears that:
  - cost comparisons of in-house versus outside timesharing rapidly lose significance after conversion because of changes in the work mix and increase in the work load
  - respondents are consistent in their estimates of a 40% to 50% difference in in-house costs compared to external timesharing
  - some of the cost comparisons made are wildly inaccurate; for example, one respondent with two dedicated DEC 10s stated that equivalent services would cost \$20 million per year on the outside when it would more probably be \$2 million to \$3 million.

- Only 5 respondents could give comparisons of planned and actual conversion costs. Of these, 3 had experienced costs at least doubling.

- The 17 respondents estimating actual conversion costs can be divided into two groups:
  - those with a conversion cost of about \$50,000, about 10 respondents converting \$100,000 to \$500,000 per year of timesharing
  - those with a conversion cost of about \$200,000, 7 respondents typically converting \$1 million to \$2 million per year of timesharing.

- Conversion costs are not a major factor in planned or actual cost analyses, as shown by the large numbers of "don't know" responses. Furthermore, at "savings" levels of 50% the conversion cost payback appears to be a few months in most cases.

c. Impacts, Advantages, and Disadvantages of Timesharing Conversion

- As shown in Exhibit III-27, by far the majority of respondents felt that conversion had a positive effect on management. The responses reflect:

    - increased demand
    - increased management sensitivity to timesharing and its capabilities
    - closer user involvement with data processing
    - increased integration of timesharing with regular processing
    - increased cost sensitivity for internal and external data processing.

- INPUT considers these are fundamental trends which will continue. The user involvement and cost sensitivity of management will cause problems for the DP departments.

- Again cost reduction shows up as the main advantage according to the respondents, as shown in Exhibit III-28, with control firmly in second place. There are, then, a whole variety of advantages, many of which relate to interfaces with other in-house operations and features such as applications software.

- Few respondents felt that their in-house function had no disadvantages compared with outside vendors. These disadvantages can be put into two main groups:

    - they can't match the resources and products offered by outside vendors.

EXHIBIT III-27

RESPONDENTS' ESTIMATION OF MANAGEMENT IMPACTS BECAUSE OF CONVERSION

No (minimal) impact - 8 respondents

Management realizes importance of T/S - 3 respondents
Regard T/S as critical department

More automation
More data wanted more often
Management use of T/S for planning and research
Over-time, T/S used more at all levels
Substantial impact; more timely use of critical data

Able to lead marketplace
Can quickly have information about alternative courses of action
Management more satisfied
Improved control of accounts receivable

Pressure to convert batch to timesharing
User closer to computer department
Must be more responsive to user's needs
Gives better control to users

Much more willing to control costs
Reduced cost by $600,000 over 2 years

Hassle over costs
Comparison of in-house and outside costs
More delicate reliability and expandibility problems
Coordination problems

EXHIBIT III-28

ADVANTAGES AND DISADVANTAGES EXPERIENCED OVER OUTSIDE TIMESHARING

ADVANTAGES	DISADVANTAGES
Costs less, 25 respondents	None - 5 respondents
Control, 11 respondents	Can't provide resources offered by outside vendor - 3 respondents
Efficiency of programming maintained and monitored	Outside has more packages and system improvements to offer
Visibility of costs	Some applications better off on outside timesharing
Select vendor and system	
Control of excessive use	Vendors more able to support users
Control of data files	Outside vendor can do more handholding
Satisfy more user requirements	
Access to in-house packages	Outside vendors have better products and systems
Ability of knowing what's going on	
Standardization becoming possible	More support by outside vendors of applications packages
Same languages	
Education	
Flexibility	Down 4 hours a night
Security	Response time 2 times GE's
More users, better attitude	Lost capability
More businesslike manner	Too costly
More reliability	Runs up costs
Compatibility	Unable to provide some services
Can respond faster than outside	Not as smooth in handling users
Program development easier	Availability of time and schedule
Enhances experimentation	Performance problems
Accessibility	Not able to provide consistent response
Quick turnaround	
Better use of internal data	Relatively poor service
Better shipment accountability	Users need a lot of handholding
	User dissention when system down
Can expand at lower cost	Need to become like outside to users
	Lack of volume on in-house timesharing
	Danger that monopoly will cause timesharing to be less responsive to user needs
	Hard to keep multiple users happy
	Harder to innovate, to try new applications
	Fairly high overhead
	Department billing a problem
	In-house shop complacent in its attitude toward users' turnaround and response time
	Bigger machine room; hassle fromusers

- inability to provide the level of service obtainable from outside vendors: availability, reliability, response time, and particularly, support problems were mentioned.

- However, in their evaluation of user preference, respondents gave self-serving answers;

  - 50% stated users preferred internal
  - 35% stated users felt there was no difference
  - 15% stated users preferred external.

Again, however, several respondents mentioned that users preferred the outside services and internal costs.

d. Overall Differences Between Planned and Actual In-House Performance

- As shown in Exhibit III-29, the most significant difference respondents have found between the planned and actual operation of their in-house timesharing function has been the increase in its expected level of use.

- Over 25% of respondents admitted that they had performance problems, which required more resources to be made available in some cases.

- On the other hand, several respondents were very happy with their performance. There was some indication that those with dedicated, tailored systems did better than those using their systems for standard processing as well.

EXHIBIT III-29

RESPONDENTS' EVALUATION OF DIFFERENCES BETWEEN
PLANNED AND ACTUAL IN-HOUSE TIMESHARING OPERATION

None - 7 respondents

Timesharing use grown faster - 11 respondents

Timesharing use grown slower - 2 respondents

Takes more core
More resources required - 2 respondents
Response time worse - 2 respondents
Can't have as many users without degradation
Service a problem
CDC software not as effective

Needed to establish better accountability of timesharing costs
Hardware costly - bigger than thought it would be
Timesharing costs lower - PDP 1150

Very pleased - 370/168
Far more successful than expected - dedicated 370/145 with RAMIS
Performed better than expected - PDP 1150
Availability better than expected - dedicated 370/168 with RAMIS

e. Timesharing Use Before and After Conversion

- In all phases of use, there has been a significant increase in use as shown in Exhibit III-30. The increases in numbers of terminals, simultaneous users, and overall users more than justify the increased levels of use previously reported in terms of equivalent outside cost.

- Terminal use changed in type as well as numbers, as shown by Exhibit III-31. The most significant moves are:

  - to CRTs
  - to intelligent terminals
  - use of remote batch terminals in some cases

- IBM has not appreciably increased its penetration in terms of number of users, but the number of terminals involved has, of course, substantially increased.

- The DECWRITER is obviously the most successful "new" terminal as the teletypewriters are replaced.

- The most significant shifts in terms of line speeds are, as shown in Exhibit III-32:

  - transfer from 150 bps to 300 bps
  - growth of high speed use, for CRTs and, to a lesser extent, remote batch.

- Of the high speed use, 5 users were at 4800 bps, 2 at 9600, and 1 at 50 Kb.

EXHIBIT III-30

USER CHARACTERISTICS BEFORE AND AFTER TIMESHARING CONVERSION

CHARACTERISTIC	BEFORE		AFTER	
	AVERAGE	NUMBER OF RESPONDENTS	AVERAGE	NUMBER OF RESPONDENTS
NUMBER OF USERS OVERALL:				
All Respondents	307	23	788	23
Respondents Giving Both "Before" and "After" Figures	187	20	517	20
NUMBER OF SIMULTANEOUS USERS:				
Maximum	31	19	57	29
Average	14	16	37	25
NUMBER OF TERMINALS:	61	21	187	32

EXHIBIT III-31

TERMINALS USED BEFORE AND AFTER TIMESHARING CONVERSION

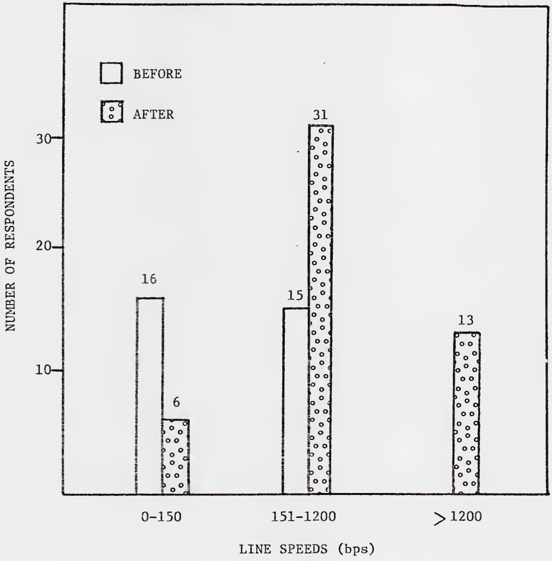
TYPE	# RESPONDENTS USING BEFORE	# RESPONDENTS USING AFTER
IBM 1050	1	0
2701	1	0
2740	1	0
2741	5	1
2780	0	1
3260	0	1
3270	0	5
3277	0	1
3767	0	1
"TELETYPE"	17	5
GE TERMINET 300	6	4
DECWRITER	0	7
DEC	0	1
DEC 500	1	0
PDP 11	0	1
AJ	1	1
DATA 100	0	1
DATAPOINT	1	3
DATASPEED 40	0	1
DIABLO	0	2
GSI	1	1
HP	0	1
HAZELTINE	1	2
JACKSON	0	1
TEKTRONIX	0	2
TI	0	4
"CRT's"	0	6
"HARD COPY"	0	7
"RJE"	0	2

Total Number of Respondents Before = 23

Total Number of Respondents After = 32

EXHIBIT III-32

COMPARISON OF LINE SPEEDS USED BEFORE AND AFTER CONVERSION



Number of respondents before - 24
Number of respondents after - 31

- Some of this shift in line speeds used can be attributed to the length of time since conversion; terminals and networks have changed considerably in the time since some of the respondents first went inside.

- For "access points" it appears that the number has effectively doubled since conversion, in the average case from just under 10 to just under 19. Thus networks would appear to be important to these organizations. However, users regarded separate departments as access points and many applications are only used from one particular location.

- Very few respondents could, or would, give measures of the jobs processed before and after conversion. Respondents measured use in terminal sessions per day, week, or month. The number of reported sessions varied from 250 per day to 1200 per day with an average of about 400.

- The main changes in language use are as shown in Exhibit III-33:
    - conversion from BASIC to FORTRAN
    - increased use of COBOL and PL/1

- The extent of use of PL/1 in this context is not so surprising because it is better adapted to interactive business processing than COBOL.

- As far as special software is concerned, perhaps a third of the respondents stated they used some form of proprietary software for the work they converted in-house.
    - several respondents were using the vendor's data base

EXHIBIT III-33

LANGUAGES USED BEFORE AND AFTER CONVERSION

LANGUAGE	BEFORE	AFTER
BASIC	17	13
FORTRAN	21	30
APL	1	2
COBOL	4	20
PL 1	1	14
ALC/BAL	-	2
PLS	-	3
AUTOCODE	-	1
FDL II	-	1

Before - 25 respondents

After - 35 respondents

management system

- statistical packages were mentioned several times

- other comments included "usual software" and "all types."

- Once converted, the special software used was normally a language or data base management system:

  - 5 respondents mentioned IMS

  - 3 respondents mentioned RAMIS

  - GPSS, APL and TOTAL were also mentioned.

- Several respondents commented that they had also implemented RJE or remote batch facilities, usually using TSO. Another mentioned the establishment of their own communications network since they have set up their timesharing function. The only other change mentioned of significance was in the support area:

  - "In-house support is something of a monster; we did not realize the amount of support and resources that would be required."

- In examining the specific applications and users which were converted and the mode of operation after conversion, only those respondents with a limited conversion activity were able to respond. Over a third of them simply stated that there were too many to catalog; one respondent commented, "We have 15 departments, 500 to 700 users, and an unknown number of applications."

- Of the 20 respondents that did provide data, only one had converted all the external timesharing to other modes, in this case internal batch

processing. However, there was a significant move to remote batch; the modes of processing of applications converted in-house were:

- 25 continued on timesharing
- 6 are operated in timesharing/remote batch combined
- 3 are completely in remote batch
- 3 are completely batch.

- Thus almost a third of the applications mentioned had their mode of operation changed when they were converted in-house.

- The type of application converted ran the gamut of standard timesharing applications; for many of the respondents it was "all of them."

- Two-thirds of the respondents stated that they had integrated non-timesharing applications with timesharing, and several of the remainder planned to do so.

- Combining this with the small, but significant, movement to integrated remote batch/timesharing operation of converted applications noted above, shows that in-house departments will have timesharing functions that work with their standard business applications and other modes; timesharing will not be separated as it is now. This is the most difficult problem for timesharing vendors to overcome since the in-house departments have the data files and can effectively "lock-out" the outside vendors.

- File switching and file sharing through the use of mini-controlled disk and other storage systems will facilitate this development.

B. END USERS OF TIMESHARING

1. CHARACTERISTICS OF CONVERSION

- Of the 28 end users interviewed, several were in the process of converting and one was converting back from in-house to outside. These users were almost all references from the DP department.

- As shown in Exhibit III-34, the major years of conversion for the users responding to the survey were 1975 and 1976 in terms of dollar amounts, with 1975 being the most frequently mentioned year. For over half the respondents the conversion activity is recent.

- The vendors mentioned in conversion and those with whom business is still conducted are dominated by GE, as shown in Exhibit III-35. Of those continuing to be used half will be converted in-house, and the other half, usually the data base suppliers, will continue to be used outside.

- Those 18 users who were prepared to estimate, reported that their work has effectively doubled since converting in-house:

  - pre conversion level \$1.5 million per year, in total

  - post conversion level \$3.1 million per year. in total

- Since DP managers reported an effective trebling of use of time-sharing, the difference must come from two sources:

  - overestimates by DP managers

  - new users of internal timesharing

EXHIBIT III-34

AMOUNT OF USERS' CONVERSION OF TIMESHARING IN-HOUSE BY YEAR (CUMULATIVE)

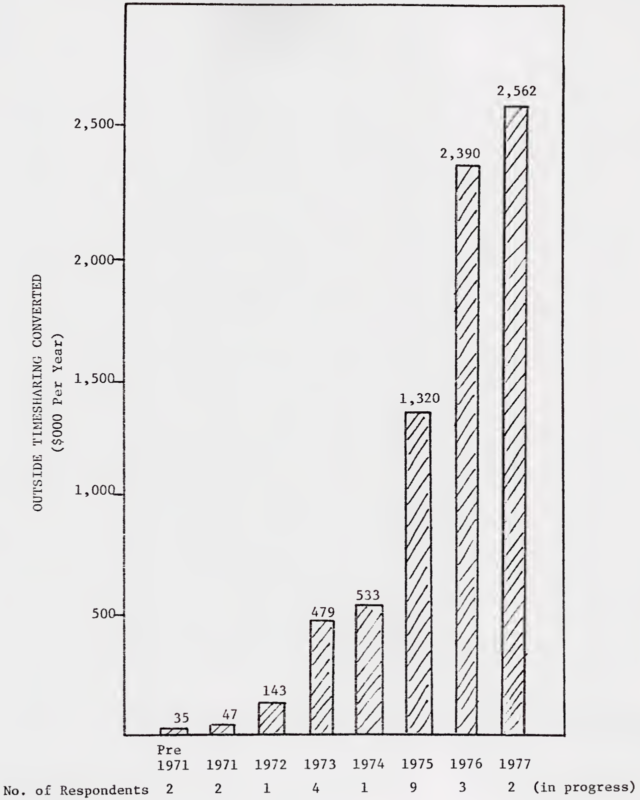
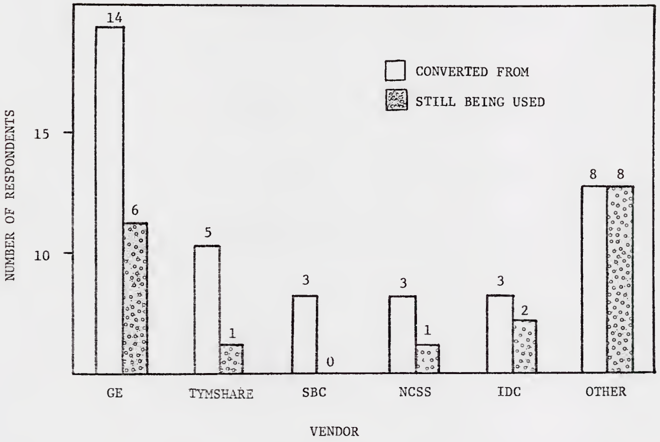


EXHIBIT III-35

TIMESHARING VENDORS INVOLVED IN USERS' CONVERSION



INPUT considers the latter reason to be overriding and consistent with what the managers themselves reported in terms of user demand.

- Cost again was important to users, as shown in Exhibit III-36; over half the respondents identified it as a factor for them, not just for DP. Those that reported showed savings to them of over 50%, on average.

- Again, a significant number of users want compatibility with in-house systems and files. These felt that the in-house function would not merely be cheaper but would also offer them greater capability and flexibility in their applications.

2. COMPARISONS OF TIMESHARING USE BEFORE AND AFTER CONVERSION

a. Cost Comparisons

- The actual reduction in costs to users is substantiated by:
  - 11 respondents reported costs down
  - 2 respondents reported costs same
  - 5 respondents reported costs increased

- All those respondents reporting increased or the same costs reported substantial increases in use, which more than offset cost differences.

- The average cost reduction reported was 48%. However, this was made up of two fairly distinct groups:
  - respondents reporting 20% or 30% savings
  - respondents reporting 60%, 70%, or 80% savings

  There appeared to be no basic reason that could be determined for

EXHIBIT III-36

USER RESPONDENTS' REASONS FOR CONVERSION

- In-house costs 25% of outside
- In-house much cheaper
- Reduce costs - They are half of what they used to be
- Projected savings
- Will save 3/4 of outside cost
- Cost
- Cost-running at 1/4 to 1/5 of outside
- Save money
- Reduce costs by 50%
- Save people costs (?)
- Defray cost of new computer

- Compatibility with in-house batch
- Common data base
- GE could not move fast enough to link files

- No in-house previously available
- Got computer

- Greater capability
- Recognized potential timesharing growth

- Program development needed
- Needed better payroll package

the constituency of the two groups. Whether the system was IBM or not, dedicated or integrated, seemed to make little difference.

b. Respondents' Preference

- As far as preference goes, 24 users responded as follows:
  - 58% preferred in-house
  - 25% preferred outside
  - 17% felt there was no difference

- However, several of those preferring in-house, felt that the outside level of service was better but costs were the deciding factor:
  - "service not quite as good as outside, but it can be lived with"
  - "need a better level of service from inside"

- Also, several of those preferring outside made comments such as:
  - "too costly"
  - "except for costs"

- Certainly, these users gave little support to the hypothesis that in-house timesharing is only installed for the benefit of data processing departments. As response time and reliability of in-house systems improve, even those now preferring outside because of poor performance in these areas will switch.

- As shown in Exhibit III-37, user respondents ranked response time, availability, and reliability higher on the outside than in-house. However they surprisingly ranked support better from in-house than outside

EXHIBIT III-37

USER RESPONDENTS' RANKING OF TIMESHARING CHARACTERISTICS BEFORE AND AFTER CONVERSION

CHARACTERISTIC	AVERAGE RANK *		NUMBER OF RESPONDENTS PREFERRING		
	BEFORE	AFTER	BEFORE	AFTER	EQUAL
RESPONSE TIME	8.0	6.9	11	3	8
HOURS OF AVAILABILITY:					
Scheduled	8.9	8.3	8	3	7
Actual	8.8	8.1	6	3	7
RELIABILITY	8.5	7.8	10	4	8
FEATURES	7.6	8.2	5	6	5
EXPANSION CAPABILITY	7.2	7.8	3	8	2
SUPPORT:					
Technical	7.5	8.3	6	9	2
Business	7.8	8.5	4	5	4

*on a scale; 1 = terrible, 10 = excellent

and preferred the features and expansion capability of the in-house function.

- The importance of the above rankings is that response time and reliability should improve in-house, as long as their systems don't get saturated, so that in-house will catch up with outside vendors, who have very little margin to improve in these areas. At the same time, the features and expansion capability will tend to increase in-house, perhaps enlarging the gap between in-house and outside vendors.

c. Characteristics of the Service

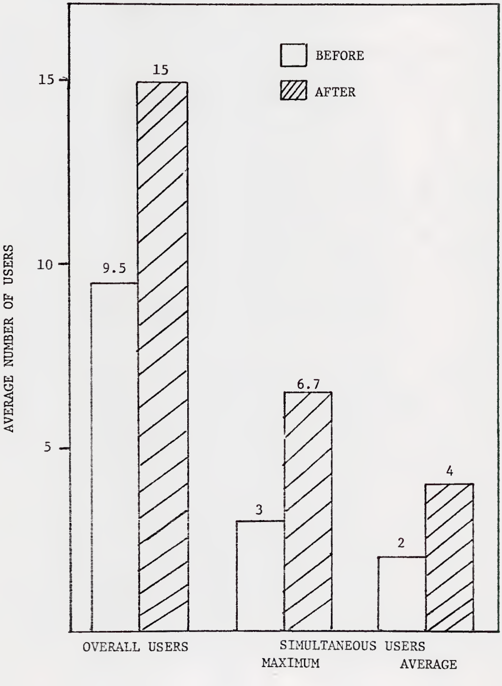
- Exhibit III-38 shows that the number of overall users has increased by 60% or more on the average since conversion. The expansion of the use of the service is further demonstrated by the doubling of the maximum and average number of simultaneous users.

- The numbers of terminals have not increased in the same proportion showing, perhaps, an underutilization of terminals with outside time-sharing. This would be consistent with the consolidation that often accompanies conversion.
  - average number of terminals used before conversion is 8
  - average number of terminals used after conversion is 11

- Changes in terminal use parallel those reported by DP managers:
  - "teletypes" decreased from 9 users to 4
  - DECWRITERS increased from 1 user to 5

EXHIBIT III-38

USE OF TIMESHARING BEFORE AND AFTER CONVERSION



- TI increased from 1 user to 4
- CRTs increased
- intelligent terminals increased

• Line speed changes parallel responses from DP managers and also the terminal changes:

- 150 bps decreased from 7 users to 0
- 300 bps increased from 9 users to 18
- higher speeds, up to 4800 bps, increased from 0 users to 3.

• Again PL/1, COBOL, and FORTRAN were used more frequently after conversion:

- FORTRAN users increased from 12 to 17 users
- BASIC decreased from 11 to 8 users
- COBOL increased from 1 to 5 users
- PL/1 increased from 0 to 7 users (over 25% of respondents)
- several other languages, such as SNOBOL, X-4, FISCAL, PLS and UNIAPT were used after conversion.

• Unlike DP managers, most users were able to give an estimate of their current workload in terms of jobs processed per day; many of them also gave pre-conversion workloads. The average increase in jobs run per day was 300% with several users running 6 times as many jobs per day as before.

• Few users identified special software used before or after conversion. "GE packages," FMS, EXPORT, and "Vendor Data Base Access"

packages were identified as special software used before; IMS, EASYWRITE, SIMPLAN, RAMIS, FORESIGHT and UNIAPT were mentioned as being used after conversion.

- Other changes noted included:
  - the use of Economic Research Associates' and Urban Decisions' data bases
  - control of programmers as they build a nationwide IMS application
  - getting CDC 6600 debugging system.

- The bulk of applications converted were still performed on timesharing as shown below:
  - 16 applications converted to internal timesharing
  - 8 applications converted to internal timesharing and remote batch
  - 4 applications converted to internal remote batch only

- The users reported a wide range of applications being converted:
  - 7 respondents converted planning or forecasting applications
  - 5 respondents, including 3 Federal Government respondents, converted engineering or technical applications
  - 7 respondents reported converting financial or accounting applications

- Two-thirds of the 23 responding users reported that they had integrated non-timesharing applications with timesharing. This is another indication of the "growing together" of standard business applications and timesharing.

C. FINANCIAL OFFICERS

1. SUMMARY OF FINDINGS

- We were able to interview only 11 financial officers or about 25% of the interview sample. Our greatest difficulty was in locating financial officers for whom the interview was at all applicable. Information obtained from financial officers was often "sketchy" with frequent referrals to the D.P. department.

- The results of the financial officer interviews were consistent with the information and findings obtained from the Data Processing Manager interviews.

- The data or information processing division in most instances started the move to establish in-house T/S, frequently to support programming development; it also initiated the conversion activity.

- The financial department, by and large, did not play a direct role in the decision making.

- The evaluation was primarily carried out within D.P. with management "rubber stamping" the decision.

- Cost was by far and above the major factor in the evaluation process.

- By and large, no weighting scales were used.

- No significant data was obtained with respect to planned vs. actual savings.

- "Incremental" costing was more frequently used in cost determination. This appeared primarily due to the fact that most internal systems were IBM and the TSO option was initially implemented for program development.

- No significant data was obtained with respect to elements used in cost determination.

- Actual cost estimation was accomplished primarily with D.P.

- Most respondents referred the interviewer to D.P. for information about measurement of actual internal T/S costs.

- Most respondents referred the interviewer to D.P. for information about charging T/S users.

- Most respondents felt total T/S costs were less now that they have an in-house T/S system, but they were willing to continue to pay for outside services where applicable.

- Most respondents felt that the use of T/S had significantly increased since conversion.

- Most respondents were more concerned about the rate of increase of T/S costs. The average level of $250,000 per year got attention!

- Cost was the main concern with respect to considerations about going in-house.

- Most respondents felt that D.P. did raise the issue with both the hardware and T/S vendors.

- Most respondents referred the interviewer to D.P. for information about hardware vendor proposals.

- Most respondents felt that the T/S vendors were not very responsive to the developing situation. Many respondents referred the interviewer to D.P. for information about specific T/S vendor proposals.

- Most respondents felt that end-user reaction was good.

- Most respondents felt that the users preferred internal T/S as being cost effective.

- Many respondents did consider fixed-price T/S proposals to provide the equivalent of an in-house system but rejected them as too costly. Most respondents would no longer consider such a proposal.

- Most respondents did not have any further comments to offer on in-house T/S. Some offered the comment that they felt that the outside T/S vendors should reduce prices.

- The financial officers, by and large, were not willing to make proposals and studies available. They referred the interviewer to D.P. for internal price information for billing T/S users.

D. SIGNIFICANT COMMENTS FROM RESPONDENTS

Both the data processing managers and the end users were given ample opportunity to "let their hair down" and give their considered advice, in confidence, to guide timesharing vendors in their long range planning. We received a number of valuable and constructive comments, the most significant of which are summarized below:

1. DATA PROCESSING MANAGER COMMENTS

- "We decided to go internal to stop rapid growth of external timesharing, to get a handle on the situation."

- "We hope IBM will do something for the 'non-D.P. trained'user in the near future. We hope that the Data Analyzer Language and VSPC will do the job adequately."

- "We would like to be able to have more packages that are available from T/S vendors on IBM systems available for Honeywell, UNIVAC and Burroughs Systems for external/internal use."

- "We believe we are headed in the industry toward 'transaction driven' systems. This implies large data bases, data base management software, and intelligent terminals."

- "We believe many users go to T/S because of red tape in our company. We discover later that many of the applications could be satisfied by remote batch services."

- "We will always do some outside T/S, particularily for the availability of a T/S network, like GE or Cybernet, to transfer data on a national/international basis."

- "Independent of the cost considerations, we decided to go to an internal T/S system to: (1) gain control of the data--its validity--to avoid duplication, (2) to use the same programming language, conventions and documentation, and (3) simplify the education of our users."

- "Going internal speeded up the management decision to automate applications. This resulted primarily from the greater ease of data access."

- "We believe that the T/S vendors are pricing themselves out of the market; that they could provide a more varied and flexible price structure. We believe that their prices are excessive, particularily in the mass storage area."

- "Management has come to regard the RCS system as critical to the success of our company. The remote computing system, including its time-sharing functions, has become a significant factor in center profitability performance."

- "Our biggest problem in the cross use of information between the T/S vendors and our internal systems is the slow data transfer rate."

- "We believe that the quality and validity checking of information from T/S vendors is not satisfactory. We believe that the handling of asyncronous data transmission is the stumbling block."

- "We have experienced improved relations between D.P. and our operating departments following installation of an internal T/S system. By establishing a quick response user support group, we have greatly improved user attitude."

- "Management has come about from looking at T/S as a service and part of overhead to a manageable line item, like any other corporate resource."

- "As an internal T/S organization, we need to become just like an outside T/S vendor to our users."

- "We see the proliferation of intelligent terminals that can operate off of an integrated data base. This will lead to processing each transaction as it arises."

- "By going internal, we are in the danger of becoming a monopolist. As a monopolist we become less responsible to our users' needs. We want to operate our T/S service as if we were an outside vendor."

- "Having our internal T/S system service in-house users only, allows us to get proprietary packages from all sources for our internal use. This way we have a greater variety of services than from any one T/S vendor."

- "The new Federal Banking Act is speeding our conversion to internal T/S systems. We don't yet know our liability for "improper" information disclosure."

- "When the financial crunch came, we looked for ways to save. Time-

sharing costs stick out like a sore thumb, both as to total costs and to the rate of cost growth."

- "Our greatest concern is the cost of storage on disks."

- "By going to an internal timesharing system, we are finally forced to establish control over what we are doing and are looking at information processing in a business-like manner."

- "The timesharing vendors can apply innovation for new products based on advanced technology and their expertise. They need to provide better interfaces between their products and services and our internal information processing systems."

- "The T/S companies are in for a rough time. We expect to see a lot of consolidation and fallout."

- "There are real opportunities for services to smaller corporations that do not possess the expertise to use minicomputers."

- "There are real opportunities for T/S vendors with specific expertise to meet particularized demands. Suggest that T/S vendors look at the thinking of (1) accounting firms, (2) regulatory bodies, (3) federal legislation, and innovate solutions to some of the problems posed."

- "We feel we are typical with respect to how we got into internal timesharing. We put up TSO for program development and then extended its use because we found we could save money over external T/S costs."

- "The management has realized the importance of T/S to our corporate operations in a competitive market place. This realization is the most important factor in the rapid growth of T/S."

- "The T/S vendors should make it easier to go either way between inside and outside use of T/S. We would strongly prefer to be a customer that can easily try a program service, use it, then easily (for a fee) shift the activity inside if the economics or security aspects dictate it. We are willing to pay a fair price for innovation. We do not appreciate being a captive user."

- "We have achieved a 30% increase in programmer production by using the TSO option. We have found that we can convert many T/S programs to remote batch."

- "There are great savings to be obtained from the intelligent use of T/S. Many T/S programs can easily be converted to deferred T/S or even remote batch. The way T/S vendors price their services makes it difficult for a user to evaluate cost performance."

- "The recession gave our management incentive to look at T/S costs. With the expansion we have generated cash to spend on capital equipment; hence, we are going internal."

- " Our T/S costs for the same thruput are 8¢ internal as compared to $1.00 external."

- "By going internal and running our T/S service as if we were a T/S vendor, we have come to appreciate the difficulty in keeping multiple users happy."

- "We had three objectives in converting to in-house timesharing: (1) to hold down growth in external timesharing expenditures, (2) to get to in-house data in a timely manner, and (3) to improve in-house program development time."

- "The bulk of time chargeable to TSO is not really T/S but RJE. However, we have still found this approach very effective."

- "There is a distinct advantage of being able to access in-house data via our T/S system."

- "The T/S vendors need to improve their pricing structure. The structure should give discounts for (1) volume, (2) time of day, and (3) interactive or deferred (priority)."

- "The T/S vendors should look at themselves as if they are a public utility. With the advent of minicomputers and intelligent terminals, they can offer distributive computing up and down the T/S net. However, they need to develop the software to handle the distributive computing at all levels."

- "More T/S vendors should get on GSA price schedule. Users are able to order services up to $25,000 per year without formal competition. This is a distinct advantage to a user as it greatly shortens the procurement cycle."

- "T/S vendors should take cognizance of OMB policy to shift to external T/S where feasible and make GSA price structure attractive. Once T/S contracts are started, they tend to continue. No one likes to reinitiate formal procurement."

- "We believe that minicomputers will have a significant impact in T/S market places. Intelligent terminals can be used for "quick looks" at problem solving, leaving final processing to remote batch operations."

- "Timesharing companies will make it or break it over communication costs. The fight is with Ma Bell."

- "I want a transparent interface at the telephone switchboard so I can use services anywhere. If communication costs can be held down to a reasonable price, then external T/S will continue to grow."

- "T/S growth areas are: (1) word processing (ATS) and (2) data base management."

- "The T/S vendors do not discipline user's storage. They collect large fees for dead data files."

- "The data storage costs for T/S vendors are way out of line. On some of our bills they approach 100%. The average is at least 33%."

- "The T/S vendors maintain incompatibilities between their systems and IBM. This, we feel, is to their detriment."

- "Management is beginning to realize that they can have decentralized

operations together with centralized information systems using T/S and RCS."

- "The majority of large systems are IBM, but IBM has the greatest proliferation of T/S options. IBM needs to decide which T/S option(s) it will deliver as most cost effective, and T/S vendors need to offer compatibility with the selected system(s)."

- "We have a two (2) year global development plan for on-line systems. In the interim we will use both external and internal T/S systems to support its development."

- "T/S has allowed our company to solve problems as they arise but not in a cost effective manner."

- "I would like to have T/S system(s) transparent to my users. They should have one set of procedures for using the terminal for all T/S vendors."

- "The management has become aware of the potential of T/S to quickly provide data and information about alternative courses of action. T/S offers "what if" ability in financial areas which is vital to decision making."

2. USERS' COMMENTS

- "By going internal we can do a combination of interactive and remote computing using the same data files. This was too difficult to accomplish when we were on an external T/S system."

- "We believe that the T/S vendors could pool their resources more than they do, use common networks, data bases, and compatible interfaces. This would create a formidable market force in competition with IBM and the hardware vendors. The T/S vendors should offer to transfer files and data for a fee and implement distributive computing for their unique programs."

- "We are using T/S as a bridge to get into systems until we can develop a long-range plan or solution in an integrated fashion. We will continue to use T/S for special projects."

- "The shift in the management concept to 'responsibility reporting' requires that we access our internal files used for a batch system and extract data for T/S applications. We would like to go to remote batch for reporting but remain on T/S for the financial planning process."

- "If we were to use outside T/S today, we could not justify it on a cost basis because storage costs are too high--our data base is on the batch system. We peel off what we need to do T/S application. This leads to difficulties but is the only current approach which is economically feasible."

- "We feel that the credibility of the T/S vendors has been impaired by

their cutting prices after the fact. We do not understand why they do not offer an improved price policy before we have to face the issue."

- "We feel that data errors are very costly when using external T/S systems. We think that intelligent terminals will help, but that the T/S vendors can offer "quick look" programs (data analyzers) for non-sophisticated users which would help reduce the re-run time and costs."

- "We get a degradation of performance with respect to T/S, but our costs are significantly lower, so internal T/S is more cost effective."

- "The timesharing vendors should use such processes as are offered by the 'Archive' and 'Alert' programs to help non-sophisticated users with file/disk storage efficiency and cost."

- "It would be very helpful if the T/S vendors would establish user oriented prices (i.e., per transaction) rather than resource pricing which he doesn't understand."

IV. ANALYSIS OF RESULTS OF VENDOR RESEARCH

A. COMPUTER MAINFRAME MANUFACTURERS

- Three hardware vendors who market in-house systems in competition with timesharing were evaluated: IBM, Honeywell and DEC. Information was obtained from current and former employees of the vendors, a major timesharing user who opted to go in-house and selected Honeywell (after strong IBM competition), and from the timesharing vendors during the course of those interviews.

- To a certain degree, the information obtained about the hardware vendors represents a "mirror-image" of the information obtained from the timesharing vendors. However, hardware vendor strategies and reactions will be presented individually.

1. IBM

- IBM accounts for most of the revenue which is lost by timesharing services, but it does not appear to market on a straight replacement basis even against systems with which it is directly competitive. IBM's overall

strategy is designed to achieve much broader objectives than the replacement of timesharing services.

- External timesharing expenditures are very useful to IBM in justifying both hardware and software upgrades. In fact, such expenditures are so useful it is doubtful whether IBM really cares whether they are eliminated so long as they can continue to provide cost justification for more hardware sales.

- The marketing approach taken is to promise timesharing virtually "free" when it is integrated with batch processing. In addition, the compatibility with other IBM systems (especially in the data base area) is emphasized.

- The data processing manager and not the end user is the natural target for these tactics, and he is also a natural ally since he would like to maintain and extend his control over the computer services provided (including security)

- IBM has excellent intelligence on all competitors including timesharing vendors, and they are normally well-established in most companies which use such services. They will exploit their relationship at all levels when it is deemed appropriate especially when there is any threat to their batch or data base systems.

- IBM has had a poor track record in timesharing, and their many offerings: TSO, CMS, VSPC, APL, etc. indicate internal conflict rather than a broad plan to address the market place. Their systems are

expensive and cost effectiveness is not emphasized.

- Recent hardware announcements (138 and 148) have the potential for making timesharing available on more economically priced systems--with traditional growth potential.

- Competitors (both systems and service vendors) know IBM's weakness in the timesharing area and combat IBM efforts to replace timesharing with in-house systems by pointing up past failures and cost effectiveness.

- IBM does not have a solid plan to provide or assist users in network development. This deficiency in the communicating area is recognized, and SNA, SDLC and security will be used to encourage (or require) more integration.

- IBM recognizes the desirability of establishing (or controlling) a communication's network to supply services to its customers. It has the resources and need to diversify into profitable areas and will make every effort to strengthen its communication capability.

- IBM recognizes the necessity of supplying total systems service--hardware, software and communications. Their ultimate strategy could place them in direct competition with computer service vendors.

2. HONEYWELL INFORMATION SYSTEM

- Honeywell has several, proven timesharing systems available for its hardware. It has not had as much success in the replacement of timesharing

as one might expect from the quality of its products.

- This is partially due to IBM's view of Honeywell as a direct competitor in the broader data processing market and Honeywell's conditioned aversion to most direct competition with IBM.

- Honeywell views the replacement of external timesharing with in-house DTSS systems as a good potential market. They are beginning to market actively with Dartmouth support in this area.

- DTSS is favored over GEOS for reasons of performance and because IBM views GEOS with more disfavor than DTSS (because of potential impact on batch and data base). Honeywell found IBM extremely agressive against any GEOS proposal and less so against DTSS.

- DTSS is viewed as being very competitive (both function and cost) with outside timesharing services and fast paybacks are promised.

- Honeywell senses a trend toward in-house systems whether on large scale or minicomputers and wants to actively compete for this business. They feel specialized carriers (such as Telenet) may provide an eventual answer to some of the "communications' problems" feared by customers in bringing timesharing in-house. (This is understandable since they were hardware suppliers on the ARPA network).

- Honeywell feels they know most of the large timesharing customers through their sales force and T/S marketing activity.

- Honeywell characterizes timesharing vendors' reactions to their

in-house DTSS proposals as follows: (1) First, they emphasize service and packages, (2) They ask the customer why he should bother with systems programming, customer service, communications, etc., and (3) Then they cut prices.

- Once a major proposal has been submitted T/S vendors are not really effective in resisting because their sales force has not been trained to deal above the user level (e.g., with DP managers, corporate controllers and top executives).

- Honeywell also sells timesharing services from their own network, but it is primarily viewed as sales assistance for hardware systems. Although major customers are considered worthwhile, most of the sales orientation is placed on hardware.

- Honeywell feels it has had good experience with the design and implementation of computer/communication networks and data base systems. They hope to capitalize on this in the future, but they are not as aggressive in the market place as they once were and HIS profits are not viewed favorably within the corporation.

3. DEC (DIGITAL EQUIPMENT CORPORATION)

- As a successful supplier of high price-performance systems, DEC markets actively to both in-house users and to data service companies. While very much aware of the potential conflict, they do not seem uncomfortable with the dual relationship.

- DEC views external timesharing as a potential market for both "large scale" systems and minis. However, they are quick to point out that data service companies are also good customers and there can be a certain amount of sensitivity. Therefore, they do not have an announced plan or strategy for replacement of external timesharing but prefer to think of the market as a "business opportunity."

- DEC feels the market for T/S or interactive computing is increasing, and both in-house and T/S vendors are exceeding the capacity of installed systems. At the small end, they tend to market specific applications. For all customers, they emphasize cost in terms of price-performance. For data services companies they also present specific market opportunities for their systems.

- They are very bullish about the trends for in-house timesharing and also for service vendors using their hardware.

- While they see the 138 and 148 as being aimed at providing interactive services for smaller IBM customers, they think "super minis" with more capacity will have more impact on the T/S market. Amdahl has ramifications for both vendors and internal users because of improved price-performance.

- Many small business systems and systems designed for specific applications go to first time users. High performance opens up entirely new applications' areas.

- They are frequently approached by users of timesharing services to make proposals for in-house replacements, but normally the sales force pinpoints prospects.

- DEC feels computer service companies should be reacting to the competition of in-house systems by looking for new opportunities including use of minis and broader service offerings.

- Any company which does 15K a month with an external vendor is an excellent prospect, and if they make a firm proposal, the acceptance rate is quite high. This is especially true if there is some central control and a single T/S vendor. It is more difficult to sell to a company which is geographically dispersed and using multiple vendors.

- The outlook for timesharing vendors is quite bright if they provide unique services and specialized applications. Transaction processing and data base systems will increase the potential market for service companies, and DEC obviously plans to be a major supplier of such systems.

- DEC is approaching the future with the confidence born of success. They do not feel in conflict with data service companies and look forward to supplying high performance systems for both internal and commerical vendors.

B. REMOTE COMPUTING SERVICES (TIMESHARING) VENDORS

- The threat of in-house systems to timesharing revenues is universally recognized and vendors are constantly exposed to competition in this area. However, most feel they have been relatively successful in meeting competition of large scale systems and that the "mini threat" has not materialized as rapidly as they anticipated.

- All respondents feel the trend towards interactive computers is sufficiently strong to permit significant growth for both in-house systems and timesharing service companies. While responses varied from vendor to vendor, there was surprising consistency in most of the answers.

- The absorption of interactive applications onto large scale systems has been a source of competition and frequently is the greatest single loss category for vendors. However, it has not been as severe as was anticipated several years ago, and means of combatting it have been developed.

- Considering all of the talk about minis and their actual price-performance advantages, everyone seemed relieved that they have not as yet had the impact which appears possible. The threat is considered very real because technical developments point to lower and lower costs. The primary question is when the impact will be felt. Most vendors are developing plans to meet the threat and take advantage of the technology.

- Users are definitely sensitive to the dollars spent on outside timesharing. This sensitivity is especially apparent among financial officers and data processing managers rather than with the end users. Most vendors felt they were in competition with the DP managers who wanted to "expand their empires" and used external costs as justification.

- Vendors felt IBM's strategy on large scale in-house systems was quite clear. They used external T/S costs to justify equipment and software upgrades. The overall theme being to integrate batch, data base, and timesharing under one system. The true T/S costs being obscured in a much larger overall expenditure.

- Vendor activity on minis was not as clearly defined, and it appeared that end users frequently give impetus to the installation of minis--at least from the point of view of the T/S vendors. However, at least one vendor felt his hardware supplier (DEC) was pushing internal systems in competition with his service and felt he might need an alternate source if it continued.

- There was remarkable agreement in the percent of cost differential users consider significant with 25% or greater being practically unanimous choice. Great emphasis was placed on perceived costs and actual costs. Everyone felt hardware vendors and users failed (either consciously or unconsciously) to recognize the true cost of providing service.

- Most vendors could not (or would not) specify the percent of loss to in-house systems. Losses frequently are on an application by application

basis and not on a straight replacement. Therefore, certain applications are brought in-house but vendors sell new applications to end users. Vendors specified that overall business is growing. In fact, one vendor stated his business with customers who installed an in-house system continued to grow.

- IBM accounted for nearly 75% of the losses to in-house systems, but specific vendors with other hardware orientations reported opposite results.

- The overall trend in interactive computing will necessitate taking advantage of improved price-performance of minicomputers and vendors recognize this trend. Most emphasize that they plan to make use of advanced technology in their service offerings but anticipate continuing competition on an application by application basis. Classic timesharing of a scientific nature is especially vulnerable to the new technology, but data base systems are viewed as an opportunity for timesharing vendors.

- Reaction to IBM's announcement of the 138 and 148 was guarded. Most vendors did not feel it signified any change of direction for IBM but merely extended competition to another level, and they did not express great concern. This appears to be primarily because of IBM's past performance in timesharing, and the feeling they have not specifically targetted timesharing service companies for severe competition.

- Vendors normally depend on sales and support personnel to identify potential defectors. The relationship with end users appears quite good, but sometimes even the end users do not know an in-house system has been proposed until it is too late. Only a few companies have a really

effective monitoring program for usage and loss analysis.

- Most service companies have at least a rough plan to meet the threat of in-house systems. These plans include the incorporation of minis into service offerings and increased emphasis on commercial and data base applications. In addition, traditional strengths in networking, service to end users, reliability and flexibility will be emphasized. There are a few companies who feel they can compete without change in their current strategies and tactics.

- Practically all vendors state that the most important thing to do in counteracting in-house proposals is to be sure a competitive cost analysis is made incorporating all expenses and not just hardware. End users are viewed as natural allies in combatting in-house proposals. Service, software and network support are also emphasized. Discount strategies in in-house competitive situations are normally related to long-term contracts signifying extended commitment for a certain level of business.

- Once a solid in-house proposal has been made, there is a high probability that at least some external work will be replaced regardless of the tactics employed by vendors. Once in-house capability is in place, competition takes place on an application by application basis, and only rarely does all business disappear. Indeed, one vendor remarked, "My best customers are the ones who come back from in-house systems."

- The strengths of timesharing services are viewed as being resources and skills which are not readily available to the customers. These include: communications network and expertise, applications packages and data bases, end user support, systems reliability and performance, and flexibility in resource utilizations.

- Vulnerability to in-house proposal did not appear to have any industry orientation, nor was company size considered very significant (except in so far as large scale equipment might be installed with the potential for absorbing outside work). Applications of major importance and dollar volume were the most vulnerable because of their visability. One vendor also speculated that the main vulnerability in the future may arise from the concern about security, but this was not mentioned as a current problem.

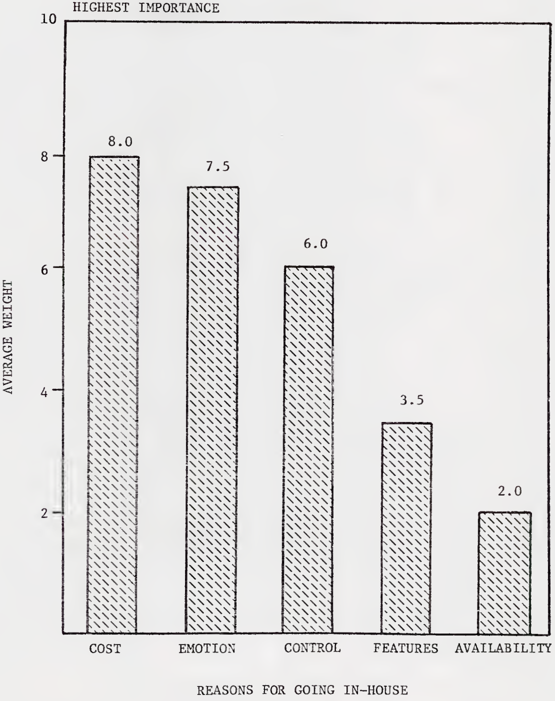
- Cost is the most important reason for going in-house, as shown in Exhibit IV-1.

- Perhaps the most significant reason is actually the T/S vendor's orientation towards the end user, and the hardware vendor's orientation towards corporate and data processing management. While T/S service companies are helping individual users with their work, hardware vendors are "helping" management with their DP planning and cost control. It is an entirely different orientation.

- In summary, computer service companies were optimistic about the future of their business:

EXHIBIT IV-1

VENDORS' EVALUATION OF REASONS FOR GOING IN-HOUSE



- They find themselves in a highly competitive environment, but the entire area of interactive computing is coming into its own.

- Advanced technology which lowers cost and makes new applications cost effective is available to computer service companies as well as hardware vendors.

- As computer/communications networks develop, the technical skills required become more demanding and implementation of in-house systems becomes more difficult.

- With the end user becoming more actively involved with interactive systems (T/S, data base, data entry, and transaction processing), the service companies' tradition of service to the end user will become increasingly important.

• Most vendors definitely saw the necessity for change in hardware, service offerings, and marketing. The companies interviewed seemed resigned to the fact that there would be continuing competition with in-house systems, but all seemed confident about the long-term future of their business.

APPENDIX I - QUESTIONNAIRES USED

CONFIDENTIAL

INPUT QUESTIONNAIRE

CATALOG. NO. [| | | | |]

STUDY TITLE: IN-HOUSE TIMESHARING-DATA PROCESSING MANAGER

1. Do you have an in-house timesharing function?

2. Did you convert outside timesharing to in-house?

3. Please indicate how much (in $/month) and when it was converted. Also, who was the vendor?

Size	Conversion Date	Vendor

4. How much has this internal timesharing use grown since conversion?

__________%

5. What were the reasons for conversion? What savings, if any, were planned?

6. What performance do you consider you have achieved in internal timesharing?

7a. Are you still doing outside timesharing? Who with and why?

7b. What applications have been added to outside timesharing since establishing your internal T/S function and why where they done outside?

7c. What is the approval mechanism for new applications to now be performed on outside timesharing?

8. Please compare timesharing use before and after conversion:

	Everything Before	Part Converted After
Number of users overall		
Number of simultaneous users Maximum Average		
Numbers of terminals		
Types of Terminals		
Line Speeds		
Access Points		
Jobs processed/ day month		
Languages used		
Special Software Used		
Other changes Please list:		

9. Please compare the applications you converted from outside timesharing before and after conversion.

Company Dept.	Application	$Volume/Month Before Conversion	Status After Conversion			
			NLD*	T/S*	R/B*	B*

*NLD=No longer done
T/S=Timesharing
R/B=Remote Batch
B=Batch

10. Have you integrated any non-T/S applications with T/S? Do you plan to do so?

11a. Please would you compare your total costs before and after conversion.

Before ($/Month) After ($/Month)

11b. What would have been outside timesharing costs if you hadn't converted?

12. How is your in-house cost made up in terms of:

Hardware ________%

People ________%

Other ________%

(please identify) ______________________________

13. Please describe your internal timesharing system:

a) Make and model of CPU ______________________________

is this purchased_____ leased_____ rented_____

b) Core size ______________

c) Operating System ______________________________

d) Communication Software ______________________________

e) Data Base Management System ______________________________

14. What changes have been made to the system since it was originally specified for timesharing?

15. Is this system dedicated to timesharing?

16. Please describe the characteristics of your timesharing service:

Characteristic	Description
Response Time	
Hours of Availability: Scheduled: Actual:	
Reliability (Up Time %)	
Features Provided	
Expansion Plans	

17. Please describe your timesharing function in terms of numbers of people dedicated to it. Please indicate the numbers involved prior to conversion in-house:

    Operators:

    Analyst/Programmers:

    Support Staff:

18. Is the T/S function a separate part of your organization or integrated into it?

19. How do you handle the interface with and support for T/S users?

20. Who started the move towards an in-house T/S system?

    Data processing ____________________

    Financial organizations ____________________

    Users ____________________

    Other ____________________

21. Did your hardware vendor 'pitch' conversion to you? Did they make a formal proposal?

22. If they made a formal proposal what differences have you experienced in cost and/or level of operation from their proposal?

23. How much conversion support did the hardware vendor provide?

24. How responsive is the hardware vendor to your needs as a T/S supplier?

25. When did you first consider converting outside T/S to an in-house function?

26. When you considered this, did you raise the issue with your T/S vendor/s?

27. If so, what kind of reaction did you get? What was the vendor's attitude?

28. What counter proposals did the T/S vendor submit to you?

29. Who made the final decision:

    a) to set up an internal T/S function?

    b) to convert outside T/S?

30. What was the evaluation process leading to the decision? Who participated in it?

31. In making the evaluation, please rank and comment on the following factors (1=unimportant, 10=critical).

Feature	Rank	Comment
Cost		
Expansion Potential		
Features		
Control		
Security		
Other		

32. What weighting scales did you use in making the evaluation?

33. How long did it take from:

a) raising the concept to starting evaluation? ______________

b) starting evaluation to decision? __________________

c) decision to completion of conversion? ___________________

34. How much did the conversion process itself cost?

Planned   Actual

35. In making overall cost comparisons, what costing accounting methods did you apply (e.g. 'full' or 'incremental' costing)?

36. How do you charge your timesharing users? What are your internal prices?

37. What management impacts have occurred because of conversion?

38. What advantages have you experienced over the use of outside timesharing?

39. What disadvantages have you experienced over the use of outside timesharing?

40. How satisfied are end users with the internal T/S vs. external?

    Prefer internal__________

    Prefer external__________

    No difference __________

41. What significant differences have you encountered between the planned and actual operation of your internal T/S function?

42. Would you have considered, or consider now, a fixed price T/S contract 'providing the equivalent' of an in-house computer?

43. Please give us any additional comments you may have.

44. Would it be possible to obtain copies of any or all of the following documentation?

Evaluation study _____________

T/S vendor proposal ______________

Hardware vendor proposal_______________

Internal Price sheets________________

INPUT QUESTIONNAIRE

CATALOG. NO. ☐☐☐☐☐☐

INTERVIEW TYPE: IN-HOUSE TIMESHARING - END USER

We understand you previously used an outside Timesharing (T/S) Service and are now being provided with service from an in-house T/S function.

1. Before conversion, how much outside services were you using and who was the vendor. Also, when was this converted?

Size($/month)	Conversion date	Vendor

2. How much has this use changed since conversion stayed the same:

increased _____% decreased _______%

3. What were the reasons for conversion? What savings, if any, were planned?

4. Are you still doing outside T/S? Who with and why? Will this be converted also?

5. Please compare your timesharing use before and after conversion.

	Before	After
Number of users overall		
Number of simultaneous users Maximum Average		
Numbers of terminals		
Types of Terminals		
Line Speeds		
Access Points		
Jobs processed/ day month		
Languages used		
Special Software Used		
Other changes Please list:		

6. Please compare your applications use on timesharing before and after conversion:

Application	$Volume/Month Before Conversion	Status After Conversion			
		NLD*	T/S*	R/B*	B*

*NLD=No longer done
T/S=Timesharing
R/B=Remote Batch
B=Batch

7. Have you integrated any non-T/S applications with T/S? Do you plan to do so?

8. Please would you compare your total costs before and after conversion.

Before ($/Month) After ($/Month)

9. How does your current 'level of service' compare with that from outside?

Comment

prefer inside _______

Prefer outside ________

No difference _________

10. Please rank (on a scale 1=terrible, 10=excellent) and comment on the following service characteristics before and after conversion:

Characteristic	Rank Before	Rank Before	Comment
Response Time			
Hours of Availability Scheduled Actual			What are they?
Reliability			
Features			
Expansion Capability			
Support: Technical Business			

CONFIDENTIAL

INPUT QUESTIONNAIRE

CATALOG. NO. [| | | | |]

INTERVIEW TYPE: IN-HOUSE TIMESHARING - FINANCIAL OFFICER

1. Who started the move to convert outside timesharing (T/S) to an in-house function?

2. What role did the financial department play?

3. How was the evaluation carried out? Who participated in the evaluation?

4. Who made the final decision?

5. In making the evaluation, please rank and comment on the following factors? (1=unimportant, 10=critical)

Factor	Rank	Comment
Cost		
Expansion Potential		
Features		
Control		
Security		
Other_______________		

6. What weighting scales did you use in making the evaluation?

7. What were the savings obtained?

   Planned $/month ____________

   Actual $/month ____________

8. In comparing the external and projected internal T/S costs what cost accounting method was used for internal costs?

   'Full' costing ________ 'Incremental' Costing ____________

   Other ____

9. What elements did you use in estimating internal costs?

10. Who did the actual costing?

11. Do you have a control system which measures actual internal T/S costs? What does it cover?

12. How do you change T/S users? Do you have an internal price list?

13. Please compare the T/S costs before and after conversion to in-house:

    Before ____________________ $/month

    After ____________________ $/month

14. To what extent has the amount of T/S use changed since conversion stayed the same:

increased __________% decreased __________%

15. At what level, if any did you first become concerned about outside T/S cost?

16. If cost was not the main concern what was?

17. When you became concerned did you raise the issue with your hardware and T/S vendors?

18. What response did you get from the hardware vendor? What proposal was made?

19. What response did you get from the T/S vendor/s? What was their attitude? Did they provide a new proposal?

20. Since conversion, what has been the end user response?

21. How do they compare the external and internal T/S service?

    prefer external ________ prefer internal ___________

    no difference ___________

22. Would you have considered, or consider now, a fixed price T/S contract providing the equivalent of an in-house system?

23. Do you have any additional comments on in-house T/S?

24. Please could we have copies of any of the following documents:

    Evaluation study __________

    Hardware proposal ___________

    T/S vendor proposal __________

    Internal Price Sheet _________

CONFIDENTIAL

INPUT QUESTIONNAIRE

CATALOG. NO. [ ][ ][ ][ ][ ][ ][ ]

STUDY TITLE: IN-HOUSE TIMESHARING LOSSES

TYPE OF INTERVIEW: VENDOR

1. How much of a threat are in-house timesharing systems to your timesharing revenues?

   a. large scale

   b. minis

2. Who gives impetus to consideration of in-house systems?

   a. Users - Reasons

   b. Hardware & Systems Vendors, Who & What Approach?

   c. % Cost differential considered significant?

3. What % of timesharing revenue was lost to in-house systems during the last 12 months?

   ________% to large in-house   ________% IBM

   ________% other mainframes

   ________% to minis

4. What % of revenue do you anticipate will be lost during the next 12 months?

   ________% to large in-house   ________% IBM

   ________% other mainframes

   ________% to minis

5. Do you expect any new trends involving in-house systems beyond the next 12 months?

6. What is your reaction to IBM's 138 & 148 announcement in terms of its possible impacts on T/S?

7. How do you identify possible defectors to in-house timesharing?

   Sales Force

   Usage Monitoring

8. Do you have a plan to meet the threat of in-house systems?

   What is it? In general terms?

9. What tactics do you employ to counteract such threats?

   - Quantity Discounts
   - Logical Machine
   - Sell Software
   - Competitive Cost Analysis
   - RFM
   - other

10. How effective have you been?

    What % of potential business losses have you been able to save?

11. What do you consider the main strengths of your service vs. in-house systems?

12. What do you consider your primary vulnerability to in-house systems?

Which industries? ______________ What applications? ___________

______________________________ ______________________________

Which company sizes? ___________ ______________________________

______________________________ ______________________________

13. Please rank on a scale of 10 = top 0 = lowest users' reasons for going in-house.

REASON	RANK	COMMENT
Cost		
Availability		
Control		
Emotion		
REQUIRED FEATURES		
OTHER		

14a. Any comments on In-House T/S?

b. Any additional comments?

APPENDIX II - REPORTS COLLECTED

A. COST ACCOUNTING ALGORITHM FOR IBM SYSTEM 370/MODEL 168 USER

B. 1976 BUDGET RATES FOR SAME ORGANIZATION

C. PRICE LIST

D. PRICE LIST

E. CONFIGURATION AND PRICE LIST

F. PROBLEMS IN TIMESHARING CONVERSION (RESPONDENT MEMO)

G. BURROUGHS' PROPOSAL FOR IN-HOUSE TIMESHARING SYSTEM

APPENDIX II A. - Cost Accounting Algorithm for IBM System 370/Model 168 User

Please find attached the rates for our 1976 cost accounting algorithm and a comparison with the rates of 1973 through 1975 and a summary of the expected costs and recovery.

These rates are based on our expected costs and activity. The costs specified in DNF-20-76-OPN and DNF-23-76-OPN plus a 3.3 percent ISD overhead less an assumed level-of-service recovery of $60,000 are to be recovered from the seismic, batch, on-line, and TSO activity. The batch and on-line activity are assumed to be 115% of the average 1975 activity. Due to the short history of TSO and the incomplete TSO conversion, the TSO activity is assumed to be 130% of the peak week of TSO activity (1/4/76 - 1/11/76) normalized to an average month. The monthly charge to seismic is fixed by agreement. The portion of this charge (total seismic charge less direct charge) applicable to the seismic activity is sufficient to fully recover 120% of their average 1975 activity.

As you know the rates for memory and tape-time are variable dependant of the amount of memory or number of tapes used. Attachments 4 and 5 graphically show these rates.

The highlights of the algorithm changes are:

- Special rates for TSO EXCP's and TSO memory were added to recover the activity related TSO costs.
- A special rate for TSO session time for TSD and CSD users was added to recover the TSD and CSD terminal costs.
- Charges for incomplete multiple executions of a job were eliminated.
- The memory costs will be based on the size of the largest step.
- In order to have a better measure of activity the seismic "costs" will be tracked by charging regular seismic EXCP's at the normal rate and 2938 EXCP's at a special lower rate. Note that the seismic tape and disk channels are direct charged and that the actual seismic costs are best determined by charging all seismic EXCP's at the special 2938 rate.
- Changes are being made to our TSO log-on procedure to require that a project identification and optionally an organization code be supplied at log-on. Users specifying the R&D organization will be required to supply a JA number. This will allow ISD TSO use to be charged directly to the responsible organization rather than recovered through the ISD labor rates.

If you have any questions please call.

	#	USAGE		RATE	
PROCESSOR					
CPU	171110	55603	HR	308290	/ CPU-HR (168-EQUIVALENT)
MEMORY	30230	1097828	K-HR	2754	/ 100-KB-HR (AVG RATE—ACTUAL RATE IS DEPENDANT ON # K-BYTES)
TSO MEMORY	10656	24237	K-HR	0440	/ KB-HR
SEISMIC EXCP	6229	190250	K-EXCP	.033	/ K-EXCP
TSO EXCP	16487	8020	K-EXCP	2.056	/ K-EXCP
NON-TSO, NON-SEIS EXCP	117387	382390	K-EXCP	0.307	/ K-EXCP
OS JOB	11381	39300	JOBS	0.276	/ OS-JOB
S.T.	363486				
I/O ALLOCATION					
TAPE TIME	42236	20506	TAPE-HR	2.060	/ TAPE-HR (AVG RATE—ACTUAL RATE IS DEPENDANT ON # DRIVES)
DISK TIME	8679	2276	DISK-HR	3813	/ DISK-HR
S.T.	50915				
SETUP					
TAPE	57208	69751	TAPES	0.820	/ TAPE SETUP OR MOUNT
DISK	3269	6203	DISKS	0.527	/ DISK SETUP
EXPEDITE JOB	19300	9302	JOBS	2.075	/ EXPEDITE JOB
S.T.	79777				
PERIPHERAL					
PRINTER SETUP	13884	4958		2.800	/ PRINTER SETUP
LINES - TAPE	25896	42090	K-LINES	0.615	/ K-LINES
ETC	53339	128352	K-LINES	0.416	/ K-LINES
CARDS - READ	13544	4189	K-CARDS	3.233	/ K-CARDS
- PUNCHED	6634	1382	K-CARDS	4.800	/ K-CARDS
RECORD XMIT/RECV'D	8314	6358	K-REC	1.308	/ K-REC
PERIPHERAL JOB	20161	64735	JOBS	0.311	/ JOB
MULTIPART-PAGE	9633	1180	K-PAGES	8.164	/ K-MULTI-PART PAGES
FORMS	55568				
S.T.	204973				
[illegible]					
PREMIUM	60000				
TOTAL	759147				

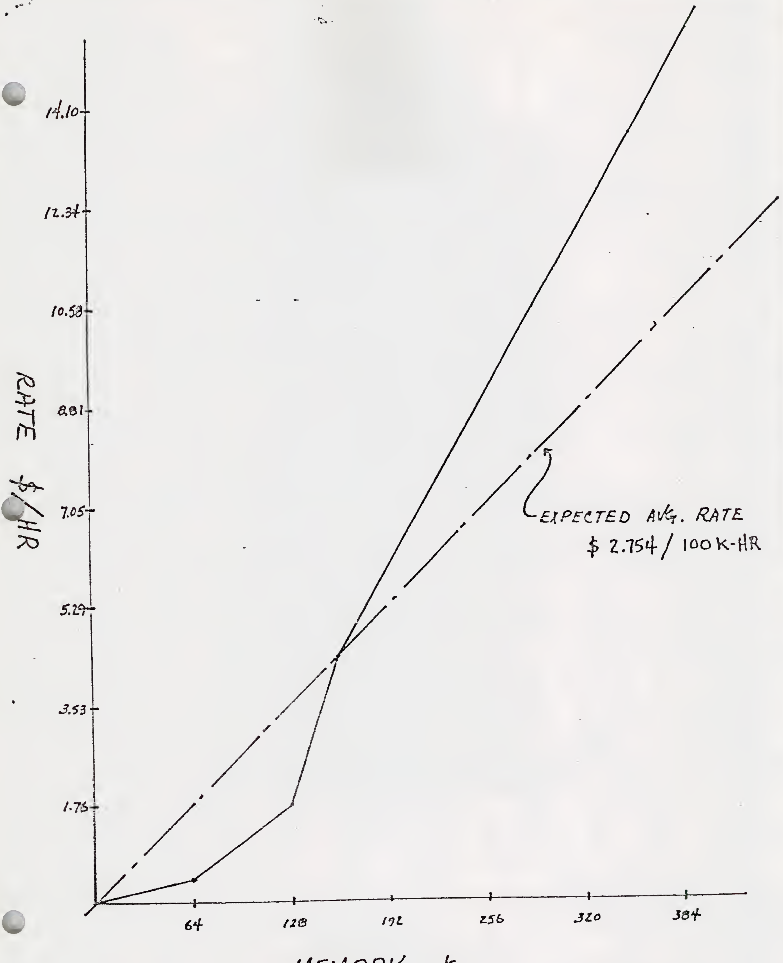
TSO SESSION FOR CSD OR TSD
USAGE
8324 3625 2.296 / HR
DNF-26-76-DPO & KRC-12-76-TSD

2/9/76
RDB

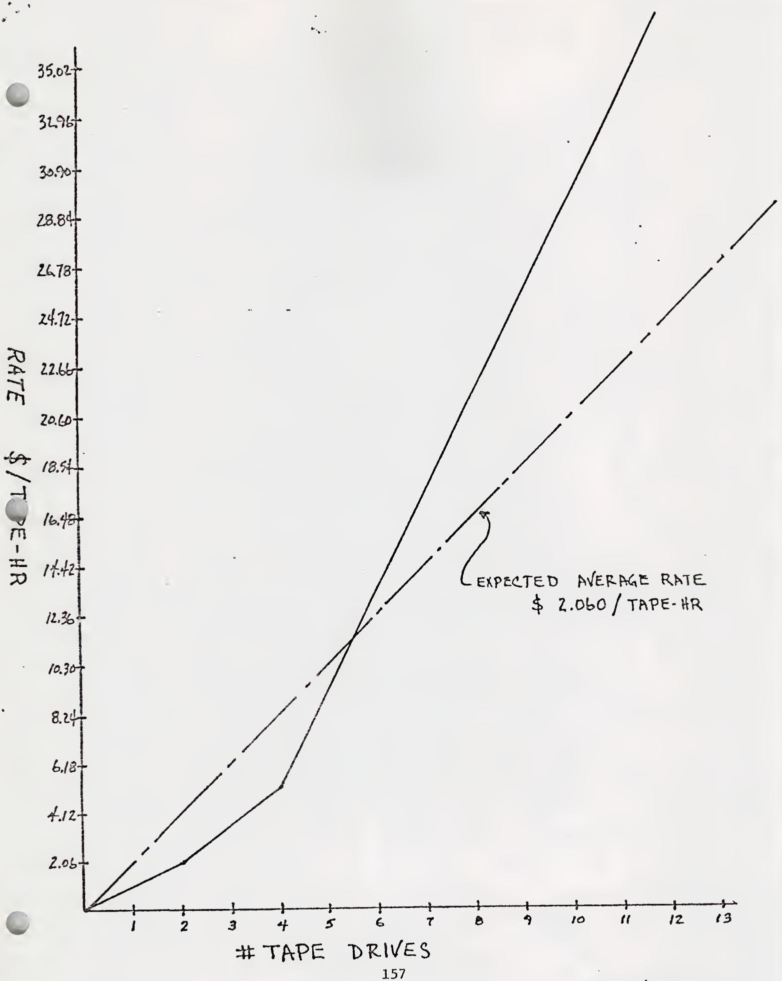
	Yearly Rates 1973	1974	1975	1976	1976 Activity	Recovery at Yearly Rates 1973	1974	1975	1976	
PROCESSOR										
CPU	404.57	376.68	282.80	308.290	55503	224548	209069	156962	171110	
MEMORY	8.89	6.54	3.60	2.754	10978	97594	71796	39521	30233	
TSO MEMORY	-	-	-	0.440	24237	-	-	-	10664	
SYSMIC EXCP	0.031	0.029	0.027	0.033	190250	5568	5517	5137	6278	
TSO EXCP	-	-	-	2.036	8020	-	-	-	16489	
OTHER EXCP	0.182	0.214	0.204	0.307	382390	69595	81830	78008	117394	
OS JOB	0.510	0.202	0.191	0.224	[illegible]	26147	10177	9774	11386	
						423788	378390	289402	363559	
I/O ALLOCATION										
TAPE TIME	1.77	2.98	2.02	2.060	20506	36296	61108	41422	42242	
DISK TIME	5.10	6.59	4.24	3.813	2276	11608	14999	9650	8678	
						47904	76107	51072	50920	
SETUP										
TAPE	1.42	1.17	0.868	0.820	69751	99046	81609	60544	57196	
DISK	2.10	0.459	0.390	0.527	6203	13026	2847	2419	3269	
EXPEDITE JOB	-	4.10	2.34	2.435	9302	-	38138	21767	19302	
						112072	122594	84730	79767	
PERIPHERAL										
PRINTER SETUP	2.98	3.15	3.44	2.800	4959	14775	15618	17086	13882	
LINES-TAPE	0.592	0.665	0.617	0.615	42090	24917	27990	25970	25885	
-CTC	0.409	0.400	0.400	0.416	128352	52496	51341	51341	53394	
CARDS-READ	1.12	2.30	3.12	3.233	4189	4692	9635	13070	13455	① EXCLUDES 3095
-PUNCHED	3.45	3.70	4.01	4.800	1382	4768	5113	5542	6634	② EXCLUDES TSO
RECORDS XMIT/RECV	2.59	0.494	0.290	1.308	6358	16457	3141	1844	8316	
PERIPHERAL JOB	0.271	0.47	0.317	0.311	64735	17543	29713	20521	20133	
MULTI-PART FORM	-	-	2.16	2.167	1180	-	-	6065	5634	
FORMS	-	-	-							
						135658	142551	141409	151331	
										2/9/76
						719416	719642	566613	645572	JDB
WEIGHTED AVERAGE RATE						1.283 ①	1.284 ①	1.00	1.09 ②	

	COSTS						RECOVERY		
	1	2	3	4	5	6	7	8	9
	DNF 20-76	3.3% OVHD	INTERNAL	SUB-TOTAL	LOS	TOTAL	INTERNAL	SEISMIC	BATCH &
	TABLE TGL						BATCH		ONLINE & TSO
PROCESSOR	363980	12011	18685	394676	<31194>	363482	18685	62693	282104
PERIPHERAL	195382	6440	20733	222563	<17590>	204973	20733	1993	182647
I/O ALLOCATION	49214	1624	4447	55285	<4370>	50915	4447	690	45778
SETUP	72885	2603	5135	80623	<6846>	73777	5135	5325	69317
T. SUB-TOTAL	681461	22686	49000	753147	<60000>	693147	49000	70708	597846
LEVEL-of-SERVICE					60000	60000			60000
TOTAL						753147	49000	70701	657846

2/9/76
ADB



ATTACHMENT 4



ATTACHMENT 5

APPENDIX II B. - 1976 BUDGET RATES FOR SAME ORGANIZATION

The 1976 Budget rates have been established for DPO activity, labor, and equipment as shown in Table One. The rates are grouped in the Table by organization.

These rates include the 3.3% ISD Overhead.

The 1976 algorithm rates for ASP usage average 9% higher than the 1975 rates. Therefore, the cost of running an "average" job in 1976 will be 9% higher than in 1975. Additional details may be found in A. D. Bailey's letter ADB-5-76-DPO.

These are the costs to be quoted to our customers or users for 1976. Additional rates will be provided as required. Anyone needing a rate for equipment, labor, or services not in the Table should contact me.

TABLE ONE: 1976 BUDGET RATES FOR DPO

I. Administrative

Item	Rate	Direct Charge Code
Card Forms	$Cost x 1.033	CF
Paper Forms	$Cost x 1.033	PF
Micromation	$Cost W/O Tax x 1.07432	M
Time Sharing	$Cost x 1.033	1
Time Sharing Terminals	$Cost x 1.033	1

II. Computer Data Handling

Data Recording	$13.75/Hr.	K
Calcomp 1036 Plotter	$41.75/Hr.	C1
Calma Digitizer	$13.55/Hr.	CM
Mohawk 7201-6401	$17.00/Hr.	M2
Mohawk 6403	$37.35/Hr.	M1
Plotter Room Personnel Only	$13.65/Hr.	PP

III. Production Control

Production Control	$15.85/Hr.	8

IV. Computer Software and Evaluations

Software and Evaluations	$3,500/Mo.	SA
Software and Evaluations	$20.92/Hr.	SH

V. Computer Center Operations

A. EAM	$30.65/Hr.	EA

B. ASP

1. CUTIP-TSO

CUTIP Activity	$0.25/1,000 Records	CA
CUTIP Disk Space	$0.27/Track	CD
TSO Disk Space	$0.20/Track	TD

2. Terminals

3277-2 Display Type Kybd	$215/Mo.	T2
3277-2 Display Type Kybd W/Audio Alarm	$220/Mo.	T3
3277-2 Display Data Entry Kybd	$215/Mo.	T5
3277-2 Display 78 Key Kybd W/10 Key Pad	$243/Mo.	T7
3277-2 Display Type Kybd W/Switch	$230/Mo.	U7
3286-2 Printer 66 CPS Variable Margin	$316/Mo.	U6
3284-2 Printer 40 CPS Variable Margin	$265/Mo.	T4
3286-2 Printer CPS	$310/Mo.	T6

2. Terminals (Continued)

3288 Printer 120 LPM (Rental)	$585/Mo.	T8
3288 Printer 120 LPM (ETP)	$502/Mo.	U8
3275-2 Remote Display 78 Key Function Kybd	$252/Mo.	U1
3275-2 Remote Display 78 Key Function Kybd W/10 Key Pad	$258/Mo.	U2
3286-3 Remote Printer 66 CPS	$238/Mo.	U3
3284-3 Remote Printer 40 CPS	$187/Mo.	U4
2740 Local Typewriter Terminal (CUTIP)	$140/Mo.	T1
2741 Local/Dial Typewriter Terminal (TSO)	$165/Mo.	T9
3767 Local/Dial Typewriter Terminal (TSO)	$260/Mo.	U7

3. Storage

Disk Pack	$15/Mo.	D
Disk Cylinders (CICS)	$2.55/Mo.	DC
Disk Drive	$1,025/Mo.	DD
Magnetic Tape Model 3	$680/Mo.	M3
Magnetic Tape Model 5	$835/Mo.	M5
Magnetic Tape Model 7	$1,055/Mo.	M7
Storage 168C - KB	$7.80/Mo.	S5
Storage 168A - KB	$7.80/Mo.	S6
Storage 168B - KB	$7.80/Mo.	S7

4. Program Products — $Cost x 1.033 — PS

5. ASP Usage - Accounting Algorithm

a) Processor

CPU	$308.92/CPU-Hr. (168 Equiv.)
Memory	$2.754/100 KB-Hr. (Avg. Rate)
TSO Memory	$0.440/KB-Hr.
Seismic EXCP	$0.033/1,000 EXCP
TSO EXCP	$2.056/1,000 EXCP
Other EXCP	$0.307/1,000 EXCP
OS Job	$0.226/OS-Job

b) I/O Allocation

Tape Time	$2.060/Tape Hr. (Avg. Rate)
Disk Time	$3.813/Disk Hr.

c) Setup

Tape	$0.82/Tape Setup or Mount
Disk	$0.527/Disk Setup
Expedite Job	$2.075/Expedite Job

d) Peripheral

Printer Setup	\$2.800/Printer Setup
Lines - Tape	\$0.615/1,000 Lines
Lines - CTC	\$0.416/1,000 Lines
Cards - Read	\$3.233/1,000 Cards
Cards - Punched	\$4.800/1,000 Cards
Records Xmit/Received	\$1,308/1,000 Records
Peripheral Job	\$0.311/Job
Multipart - Page	\$8.164/1,000 Multi-part Pages
Forms	\$Cost x 1.033

e) TSO Session for TSD or CSD

Terminal Hours	\$2.296/Hr.

APPENDIX II C. - PRICE LIST

Subject: PROGRAMMING NOTICE #17/REMOTE TERMINAL OPERATIONS NOTICE #13/TSO NOTICE #10

TOPIC: REDUCED RATE FOR LOW PRIORITY BATCH JOBS

Effective June 1, 1976, all jobs submitted with a job class of P will be charged a reduced rate of \$ .40/CRU. Class P jobs should be of low priority as there will be no guarantee on turnaround time. Turnaround may range from 24 hours to several days depending on loads.

The following rules will apply to class P jobs:

1. They will only be processed when no priority work is outstanding. This normally will mean they will process on 3rd shift.

2. Their priorities cannot be raised manually.

3. They will be subject to cancellation in the event priority jobs arrive that need their resources.

4. This will include regular batch jobs and TSO batch submits. It will not include IMS jobs.

The standard rates are listed below:

Batch Processing

1st Shift	(8AM - 4PM)	\$ .95/CRU
2nd Shift	(4PM - 12 Midnight)	\$ .75/CRU
3rd Shift	(12 Midnight - 8AM)	\$ .60/CRU
Class P	(Low Priority) (Effective 6/1/76)	\$ .40/CRU

TSO

1st Shift	(8AM - 4PM)	\$ .90/CRU
2nd Shift	(4PM - 12 Midnight) (Effective 4/1/76)	\$ .70/CRU
3rd Shift	(12 Midnight - 8AM) (Effective 4/1/76)	\$ .55/CRU

IMS

(On-Line)	\$ .55/CRU

INPUT

APPENDIX II D - PRICE LIST

Price Schedule

	U/M	Prime Shift	Night Shift**
370/168 Services			
Central Processing Unit - Batch	Hr.	1650.00	1250.00
Central Processing Unit - Time Sharing	Hr.	1875.00	1475.00
Virtual Storage	KSSU	23.00	17.00
Channels	Ch. Hr.	140.00	140.00
Tape Drive	TDH	75.00	75.00
Mountable Disk	MDH	210.00	210.00
Disk Storage	Tk. Mo.	.50	.50
Connect Time - Time Sharing	Hr.	10.00	10.00
6600 Services			
Mainframe	Per Sec	.22	.17
Tape Use	Per Sec Drive	.036	.036
Online Plotting	Hr.	30.00	30.00
Time Share Connect	Hr.	10.00	10.00
Perm Files	RB Mo.	1.35	1.35
Local Services			
Cards Read	1000	1.00	1.00
Cards Punched	1000	2.50	2.50
Printing	1000	1.00	1.00
Carbon Copies	1000	.25	.25
Mylar Punch	Hr.	20.00	20.00
Plotter	Hr.	17.50	17.50
Microfiche	Ea.	2.00	2.00
Copies	Ea.	.25	.25
Microfilm	Ea.	.17	.17
Unit Record (360-20)	Hr.	40.00	40.00
Remote Services			
Cards Image Transmitted	1000	.25	.25
Print Line Image Transmitted	1000	.25	.25

no charge currently

	U/M	Prime Shift	Night Shift**
IMS Services			
Accesses (DL-1 Calls)	Ea.	.0175	.0175
Storage	Tk. Mo.	.50	.50
IMS Test System Facilities			
Accesses (DL-1 Calls)	Ea.	.02	.02
Storage	Tk. Mo.	.50	.50
Miscellaneous Charges			
Tape Storage	Reel Day	.05	.05
Tape Mount	Ea.	.50	.50
Disk Mount	Ea.	1.00	1.00
Minimum Run Charge	Ea.	2.00	2.00
Tape Cleaning	Ea.	2.00	2.00
Time Sharing ID	Mo.	10.00	10.00
IMS Terminal	Mo.	10.00	10.00

no charge currently

Technical Support

Programmer Analyst	Hr.	$25*
Sr. Programmer Analyst	Hr.	$35*
Consultant	Hr.	$50*
Production Control	Hr.	$25*

*Plus Expenses

**7 p.m. to 7 a.m. weekdays; midnight to 4:30 p.m. Saturdays

Effective (June 1, 1976)

S O F T W A R E -- (PRINCETON)

OPERATING SYSTEM

IBM VS 2 RELEASE 1.7
HASP 4.0/RJE

TIME SHARING SYSTEMS

COBOL INTERACTIVE DEBUG
COBOL PROMPTER
FORTRAN INTERACTIVE DEBUG
FORTRAN PROMPTER
ASSEMBLER PROMPTER
TSO DATA UTILITY
TSO COMMAND PROCESSOR (DSPRINT)
STRUCTURED PROGRAMMING FACILITY (SPF)

CICS/VS

STAIRS
CICS ANAL.
CICS MASTER TERMINAL
BOSS (BASIC ON-LINE SECURITY SYSTEM)

IMS/VS

IMS/VS DB
IMS/VS DC
SCREEN IMAGE PREPROCESSOR (SIPGEN)
IMS MAP V/S
BATCH TERMINAL SIMULATOR/VS (BTS/VS) WITH 3270 FORMATTING FEATURE

APL/SV

INTERACTIVE GRAPHICS (TEKTRONIX)
FINANCIAL PLANNING SYSTEM
APL TEXT EDITOR (IBM)
MINIPERT (IBM FOR MOS PROJECT)
PROGRAM DEVELOPMENT TRACKING SYSTEM (MOS PROJECT)

COMPILERS AND ASSEMBLERS

FORTRAN G1
FORTRAN H
FORTRAN H EXTENDED
WATFOR (FORTRAN COMPILER FROM WATERLOO UNIVERSITY)
FORTRAN MOD II LIBRARY

ANS COBOL RELEASE 1.2

PL1 LEVEL F
PL1 OPTIMIZING COMPILER
PL1 CHECKOUT COMPILER
PL1 RESIDENT LIBRARY
PL1 TRANSIENT LIBRARY

ASSEMBLER G
ASSEMBLER F
OS/VS ASSEMBLER

S O F T W A R E -- continued

APPLICATION SOFTWARE

GPSS V (GENERAL PURPOSE SIMULATION SYSTEM)
CSMP (CONTINUOUS SYSTEM MODELING PROGRAM FOR USE BY ENGINEERS -- IBM)
TESTPAK (TEST DATA GENERATOR)
CROSSTABS (CROSS TABULATION AND STATISTICAL ANALYSES)
SIMSCRIPT (SIMULATOR FOR USE BY ENGINEERS -- FROM SHARE)
SIMPLAN
PSA/PSL

LP SOFTWARE

MAGEN (FROM HAVERLY SYSTEMS)
MIP/MPSX (FROM IBM)
GUB (FROM IBM)
MPSS III/BV (FROM MSS)

UTILITIES

DATAGRAPHIX (SOFTWARE FOR COM-COMPUTER OUTPUT TO MICROFICHE)
FFAB DUMP (ABBREVIATED USER DUMPS)
FDR/DSF (BACKING UP AND RESTORING DATA SETS)
PANDA (LISTING DISK DATA SETS)
PANSORT
OS AUTOFLOW II (SYSTEM DOCUMENTATION SOFTWARE)

9/1/76

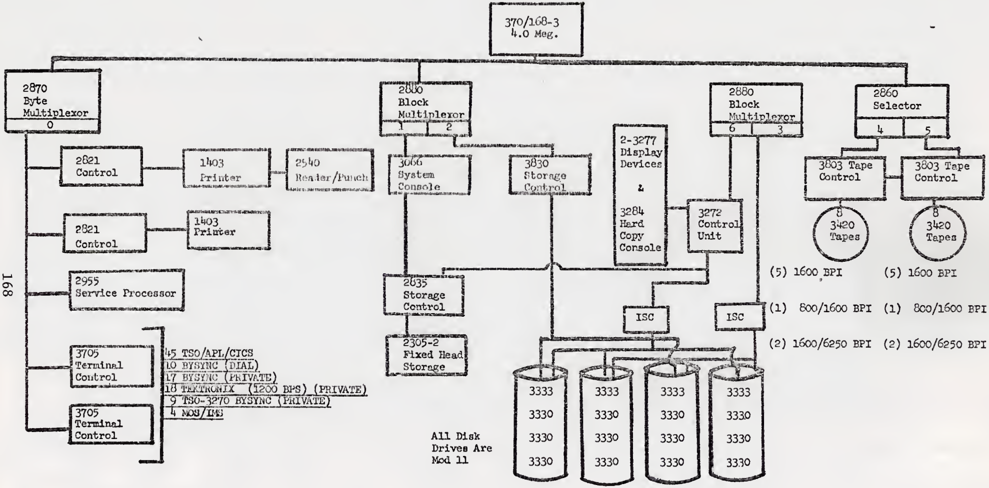
S O F T W A R E -- continued

DATA FILE MANAGEMENT

PANVALET (PROGRAM LIBRARY MANAGER)
MARK IV (EXTENDED FEATURES)
MOBSOUP (MOBIL DEVELOPED)

EMULATORS

COMMPRO 3705 TELEPROCESSING EMULATOR ENHANCEMENT



PRINCETON HARDWARE CONFIGURATION - IBM 370/168

9/1/76

~~6/24/76~~
REV. 6/30/76

NORTHEAST COMPUTER CENTER

1976 COMPUTER RATES FOR 370/168-3

EFFECTIVE JULY 1, 1976

	NEW RATES FOR 168-3	OLD RATES FOR 158
Batch Computing (Incl. RJE)		
Prime	$1.10/MCU (1)	$1.10/MCU
Deferred	.55/MCU	.55/MCU

TSO	PRIME	OFF-PRIME (2)	PRIME	OFF-PRIME
$/Connect Hour	$9.00	$4.50	$9.00	$4.50
$/CPU Second	.84	.42	.24	.12
Storage $/Track-Day	----$.03------		-----$.03-----	

APL	PRIME	OFF-PRIME	PRIME	OFF-PRIME
$/Connect Hour	$3.50	$1.75	$3.50	$1.75
$/CPU Second	.21	.105	.06	.03
Storage $/Track-Day	----$.015------		-----$.015-----	

CICS

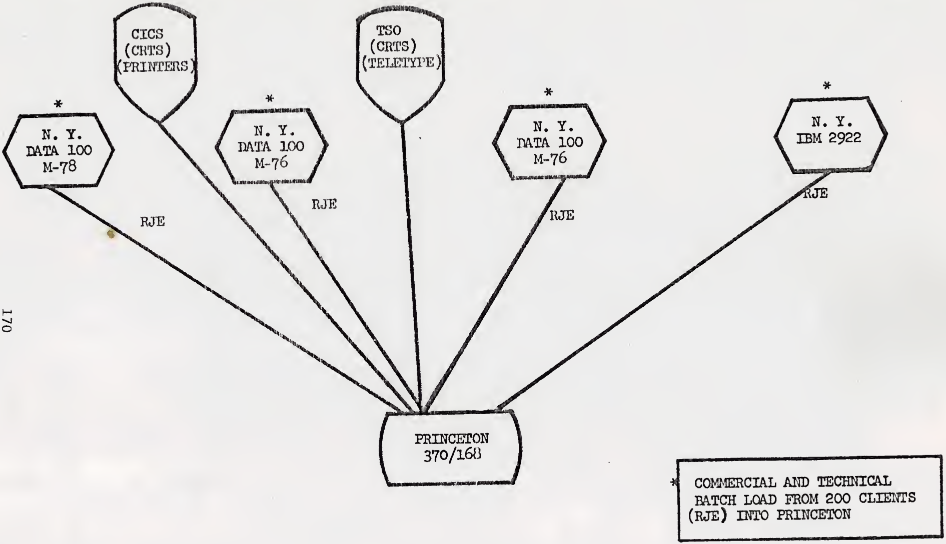
Same charge method and rates apply. Rates set individually for each application.

	NEW RATES FOR 168-3	OLD RATES FOR 158
Private On-Line Disk Pack (3330-II)	$6,500	$6,500

(1) The method of calculating MCU's will be adjusted for the different CPU speed. MCU's for any job should remain the same and the cost/MCU remains the same.

(2) Prime Time - 8 A.M. - 5 P.M.

Off-Prime Time - 5 P.M. - 8 A.M. Plus Weekends



170

NEW YORK HARDWARE CONFIGURATION

Program Problems

- Programs that are written for non-IBM computers often contain specialized subroutines not available on IBM. These are generally bit manipulation or packing routines. To solve this problem, it is necessary to identify an IBM substitute or an assembler language routine must be written. Usually, it has been necessary to follow the latter course of action.

- Programs that were written in Basic and are to be executed in a batch environment must be rewritten in another language. Prior to the present time, a Basic compiler was not available in-house.

- Programs written in MINIDATA (UCS) or INFORM (SIS) have to be rewritten due to the proprietary nature of these packages.

- The source versions of some programs written by vendors are not available and the programs must consequently be rewritten.

- Timesharing programs usually have free form I/O. These must be modified before running in-house.

- "Interactive" routines must be modified so programs can be executed in a batch environment, if possible.

- Obvious programming inefficiencies must be corrected before running in-house.

- Existing programming "bugs" must be corrected before running in-house.

User Problems

- Often, the individual who wrote the program has left the Company and no documentation exists, making it very difficult to convert the program.

- Any documentation, if it exists, must be completely rewritten to conform to S&IP Standards.

- Users generally want "improvements" made to existing systems as an inducement to operating in-house.

- Users are part time programmers and not always available to answer questions, making conversion more difficult than it should be.

- Programs have to be written to reformat files from timesharing to the in-house system.

- Programs have to be written to update files in a batch mode. In timesharing, many users take advantage of the text-editor to update their files, this does not exist for batch operations.

- Programs or data provided in punched card format by users usually contain errors that must be corrected before work continues.

APPENDIX II G. - BURROUGHS PROPOSAL FOR IN-HOUSE TIMESHARING SYSTEM

Enclosed please find a two phased configuration to handle the timesharing requirements of Phase I to handle your immediate situation and Phase II for future growth. This plan utilizes the Burroughs B6700 computer system and various peripheral devices to provide a very cost effective, high performance timesharing systm. This is a very valid approach to the solution of increasing data processing capacity requirements, with a relatively low cost associated with it.

The B6700 has proven to be a very effective timesharing system because of the nature of its architecture, the outstanding data communications capability, and the proven software capabilities of the operating system and timesharing system. In addition to this, there are many distinct advantages for with a stand along timesharing system.

You are in need of additional capacity on your present 370/168 and know of the large increase in cost that would be associated with the expansion of that system. From your studies you have decided that the cost to convert everything from your present system would also be prohibitive. Therefore, it would seem logical to look at what could most easily be removed from the 370/168 that would free up capacity.

Timesharing services seems to be the logical choice. By installing a B6700 to handle your timesharing requirements you would:

1) Provide additional capacity on the 370/168 to handle the more involved applications utilizing IMS and other hard to convert software.

2) Delay or prevent the necessity to spend the enormous investment to increase the 370/168 capacity.

3) Provide a dedicated 7 day per week, 24 hour per day timesharing service to your users.

4) Provide for a smaller actual cost for timesharing services than you now have.

5) Provide capacity for additional user services, such as APL.

6) Provide an easier to use, higher performance timesharing capability than now exists.

7) Provide an easy, modular growth path for future expansion, as requirement dictate.

In summary, the Burroughs B6700 would provide a better timesharing capability than now exists for less money, and this is why we feel it should warrant your close consideration. We would like the opportunity to show your organization our capabilities in timesharing by whatever means necessary with presentations, demonstrations, benchmarks, and user visits. The B6700 timesharing system is a proven system with many users world-wide, and should take this opportunity to investigate its capabilities and utilize them in your own organization.

We look forward to proving the B6700 capabilities and working with you to accomplish this goal.

TIMESHARING SYSTEM - PHASE I CONFIGURATION

MODEL	DESCRIPTION	QTY	LEASE / MO.
B6738	System Includes: 1 Central Processor 1 I/O Processor with 8 data switching channels 1 operator console and control with dual displays 1 Peripheral Control Cabinet	1	7,280
B6005-4	Basic Memory Module read access, error correcting memory plus memory control and memory tester	2	5,484
B6005-5	Additional memory module w/393,216 bytes of 770 ns read access, error correcting memory	2	4,580
B9950	System console desk	1	158
B9115	300 cpm Card Reader	1	135
B6110-5	Card Reader Control	1	104
B9243-11	1100 LPM Printer	1	1,026
B6240	Printer Control	1	156
B9941	Add'l 12 Print positions	1	41
B9495-2	120 KB Magnetic Tape Unit (9ch,1600 bpi)	2	880
B6395-2	Magnetic Tape Control	1	536
B9499-10	1x4 Master Electronics Exchange	1	145
B9383-8	Disk Storage/Dual Cont. (872 MB)	1	6,680
B6304-1	Disk Pack Drive Control	2	312
B6358	Data Communications Processor w/12,288 bytes local I/C Mem.	1	1,018
B6358-5	12,288 bytes additional local I/C Mem. for DCP	1	352
B6350-1	Adapter Cluster	4	812
B6650-1	Line Adapter	60	900
		TOTAL	$30,599
	LESS DISCOUNT FOR 5 YR. LEASE (5%) (7 day 24 hour Maintenance)		1,530-
		NET TOTAL	$29,069

TIMESHARING SYSTEM-PHASE II CONFIGURATION

MODEL	DESCRIPTION	QTY	LEASE/ MO.
B6738	System Includes: 1 Central Processor 1 I/O Processor 1 Operator Console 1 Peripheral Control Cabinet	2	14,560
B6005-4	Basic Memory Module W/393,216 bytes plus memory control and memory tester	3	8,226
B6005-5	Additional memory module w/393,216 bytes	2	4,580
B9950	System console disk	2	316
B9115	300 cpm card rdr	1	135
B6110-5	Card Reader Control	2	208
B9243-11	1100 LPM Printer	1	1,026
B6240	Printer Control	2	312
B9941	Add'l 12 print positions	1	41
B9495-2	120 KBMagnetic Tape Unit	2	880
B6395-2	Magnetic Tape Control	2	1072
B9499-12	2x8 Electronics Exchange	1	435
B9383-8	Disk Storage/Dual Controller (872MB)	1	6,680
B9383-7	Disk Storage/Dual Controller	1	3,136
B9486-4	Dual Drive Increment (174.4 MB)	1	968
B6304-1	Disk Pack Drive Control	4	624
B6358	Data Comm Processor w/12,288 bytes local I/C Memory	2	2,036
B6358-5	12,288 bytes additional local I/C Memory for DCP	2	704
B6350-1	Adapter Cluster	6	1,218
B6650-1	Line Adapter	100	1,500
		TOTAL	$48,657
	LESS DISCOUNT FOR 5 YR. LEASE (5%) (7 day 24 hr. Maintenance)		2,433-
		NET TOTAL	$46,224